AD-778 345

PACKET RADIO COMMUNICATIONS. VOLUME 2

F. H. Dickson

Collins Radio Company

Prepared for:

Advanced Research Projects Agency

17 April 1974

Unclassified

Security Classification

AD-778 345

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)

Collins Radio Company

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b. GROUP

None

3. REPORT TITLE

FIRST QUARTERLY TECHNICAL REPORT,
FOR THE PROJECT "PACKET RADIO COMMUNICATIONS"

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

First Quarterly Technical Report

5. AUTHOR(S) (First name, middle initial, last name)

Collins Radio Company

6. REPORT DATE

17 April 1974

7a. TOTAL NO. OF PAGES

308

7b. NO. OF REFS

86

8a. CONTRACT OR GRANT NO.

DAHC15-73-C-0192

b. PROJECT NO.

c.

d.

9a. ORIGINATOR'S REPORT NUMBER(S)

523-0699742-001C3L

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. DISTRIBUTION STATEMENT

Distribution of this document is unlimited.

11. SUPPLEMENTARY NOTES

Report consists of two volumes

12. SPONSORING MILITARY ACTIVITY

Advanced Research Projects Agency,
Department of Defense

13. ABSTRACT

Four major areas of activities in support of packet radio communications are reported in this document. These are: 1) evaluation and selection of radio link parameters for experimental packet radio system, 2) evaluation and selection of modulation and synchronization methods for experimental system, 3) equipment components analysis, 4) propagation/noise measurement equipment design data. Radio link parameter selection includes frequency range, data rates, antenna type, and expected ranges. Modulation and synchronization evaluation is based on both performance and implementation. Component evaluation consists of technological assessment in surface acoustic wave devices, RF sources, antennas, and microprocessors for packet radio application. A brief technical description and detailed design package including schematics and photographs of the propagation/noise measurement equipment are also reported.

DD FORM 1 NOV 65 1473

Unclassified

Security Classification

523-0699742-001C3L
17 April 1974

COLLINS

first quarterly technical report

Volume 2

Packet Radio Communications
Collins Radio Company

Principal Investigator:
F. H. Dickson

ARPA Order No. 2305
Program Code No. P3P10
Contractor: Collins Radio Company
Contract No. DAHC15-73-C-0192
Effective Date: 1 October 1973
Expiration Date: 31 July 1974

Sponsored by:
Advanced Research Projects Agency
Department of Defense

i-b

Collins Radio Company | Dallas, Texas

table of contents

list of illustrations

4.1 INTRODUCTION

The purpose of this document is to provide a summary of the test objectives and characteristics of the ARPA packet radio propagation and noise measurement equipment. The main body of the volume is an overview and technical design summary. The details of the design are contained in the appendices.

The propagation test set has been designed to support the packet radio propagation measurement program. Emphasis in this test program is to be given to propagation characteristics that are most significant to transmission of digital signals. Measured data exists to predict path attenuation in the various environments in which the packet radio system is to operate, but there exists very little information relative to the multipath spread characteristics and the short period distribution of impulsive noise. These characteristics will have a significant impact on both system and equipment design for the packet radio systems. The propagation test set has been designed primarily to provide more information on these two important characteristics, and also provide facilities to measure net path loss and doppler spread. Since both the obstruction attenuation and noise level is expected to vary with frequency, measurements are to be made at two frequencies (430 and 1370 MHz).

The test set consists of a transmitter and receiver. The transmitter generates data bits at approximately 79 kb/s or 158 kb/s, which are then code spread to a 10 M-chip or 20 M-chip modulation rate using a 127 chip maximal length code. The chips biphase modulate the two rf carrier frequencies. The 430 MHz output power is 10 watts and 1370 MHz, 6 watts. A high-gain omni antenna provides 2-dBi gain for 430 MHz and 9 dBi for 1370 MHz. Both frequencies can be radiated simultaneously.

The receiver has two fixed-frequency front ends but a common if. allowing only one frequency to be received at any one time. Surface Acoustic Wave Devices (SAWD's) provide demodulation and decoding for each data rate. The output data signal is correlation pulses of approximately 2 chips duration. For measuring doppler effects, all frequencies in the transmitter and receiver are phase locked to their respective precision frequency standards. The frequency standard in the receiver can be adjusted to obtain synchronization with the transmitter standard, thus allowing doppler frequency shift to be detected. For noise pulse measurements, a 50-dB dynamic range threshold detector is provided that operates at the if. frequency. One-tenth microsecond impulses can be detected and their level measured. The receiver antenna provides 2-dBi gain at both 430 MHz and 1370 MHz.

The time to design and build a test set was to be held to a minimum so that the collection of data could be started at the earliest possible date. A cost conscious, one-of-a-kind test set was constructed. Standard, available module packages were used to house the receiver and transmitter circuits. This was selected for design simplicity, flexibility, and minimum cost. The circuits contained in these modules are a mixture of printed circuit cards and board assemblies that have the components mounted on standoffs. The boards are nonstandard Collins construction, but were selected as the most effective way to get the job done within the cost and schedule objectives. The flexibility of the equipment design and

construction has been of value in the test program, allowing modifications to satisfy test program requirements.

Problems arose during the building of the equipment with vendor parts availability and changes in the desired test set performance. The following is an overview of some of the performance problems and the corrective action taken:

The test set was orginally designed and delivered to Stanford Research Institute to operate at 430 MHz and 1325 MHz. The 1325-MHz frequency under code spread occupies a 40-MHz bandwidth. Within that bandwidth are FAA flight control radars with high-gain directional antennas. The test set and the radars could not coexist. As an interim solution, a transmitter burst mode control was designed and built so that the test set transmitter could be synchronized with the radar sweep. The test set transmitter was inhibited when the radar was looking in its direction. This worked satisfactorily but the test set was later modified to operate at 1370 MHz.

Coexistence with other transmitters was also found to be a problem in the test set receiver at 430 MHz. In a per hertz bandwidth, some narrow band interfering signals appear at the receiver if. as high as 60 dB greater than the spread spectrum signal. The receiver was originally set to provide a desired signal at 0 dBm output from the 140-MHz if. The amplifier limits at +5 dBm, so even in the manual gain mode, the desired signal available to the SAWD's was much lower than planned (in the presence of interference) due to the limiting action and suppression of the weaker spread spectrum test signal. The receiver was modified to provide 13 dB more gain after the SAWD's so that the if. prior to the SAWD could be operated at lower gain and hence in a more linear region. Although there was an improvement, the dynamic range of the if. is still not adequate to coexistence at 430 MHz with some of the stronger narrow-band signals present in the test area.

A low side injection frequency (290 MHz) was used for the 430-MHz down-converter. A mixing product appears at 150 MHz within the dynamic range of the threshold detector which masks some of the noise data to be collected. The test set allows an external synthesizer signal to be injected into the down converter in place of the internal local oscillator. This was done to allow high-side injection and still retain phase lock with the 10-MHz receiver standard.

A phase jitter problem also became evident after the 1370-MHz conversion at SRI which affected doppler measurement. For the doppler tests, the external synthesizer approach was again used to provide an injection signal with low phase noise. This local oscillator phase noise problem will be corrected after testing by SRI is complete.

In summary, the test set was designed, fabricated, and modified on a short time schedule responsive to SRI's testing requirements. Although some problems were experienced with the test set, they were either corrected or the equipment flexibility allowed a fast effective alternative means of operation. The test set has not only provided the propagation and noise data for which it was designed, but also provided better insight into the problems of coexistence between spread spectrum and conventional systems.

4.2 TECHNICAL DESCRIPTION

4.2.1 Elements of the Test Set

The following lists the major items of the test set, CPN 627, 9553-001

Items	Collins Part Number
Transmit Subsystem	
Transmitter	627-9561-001
CW Transmitter Control	627-9562-001
Burst Mode Control	631-7575-001
Antenna 9 dBi at 1370 MHz, 2 dBi 430 MHz	627-9502-001
2 dBi at both frequencies	627-8137-001
Receive Subsystem	
Receiver	627-9541-001
Receiver Power Supply	627-9555-001
Antenna	627-8137-001
Threshold Detector	627-9564-001
Miscellanous Cables	627-9563-001

The transmitter is packaged in a weather protective box for mounting on a pole. A bracket on the transmitter allows convenient antenna mounting. Cables were provided to allow installation of the controls inside a building.

The receiver subsystem is mounted with SRI equipment. The threshold detector module was integrated into one of their panels. The power supply and receiver are 19-inch panel mount units.

4.2.2 Transmitter Characteristics

Figure 4-1 shows the block diagram of the transmit system. Figures 4-2 through 4-4 show the transmitter, transmitter control, and the burst mode control, respectively. The control panel is essentially a grouping of switches that control power and termination of four TTL mode control lines. Remote control is also available by selection. The burst mode control contains a variable rate generator to determine cycle time and a duration timer to select the duty cycle of the transmitter. The rate generator can be operated from an external sync derived from a cyclic radar or other user with which the test set must coexist. The rate generator range is continuously variable from 0.25 to 20 Hz in the cycle mode. The burst durations are selected to be 20, 40, 80, 160, 1000, and 5000 μs long. The burst control gates the TTL mode control lines from transmitter standby code to whatever mode was selected on the control panel. A light on the front panel indicates when the transmitter is enabled.

The transmitter contains a precision 10-MHz frequency standard and a 430-MHz and 1370-MHz oscillator phase locked to the standard. The rf frequencies are supplied to balanced mixers which biphase modulate the carrier according to the code generator chip data. Each biphase modulated output is amplified and radiated from its own set of dipole elements in a colinear antenna mast. The transmitter antenna gain is 2 dBi at 430 MHz and 9 dBi at 1370 MHz. The antenna is shown in figure 4-5.

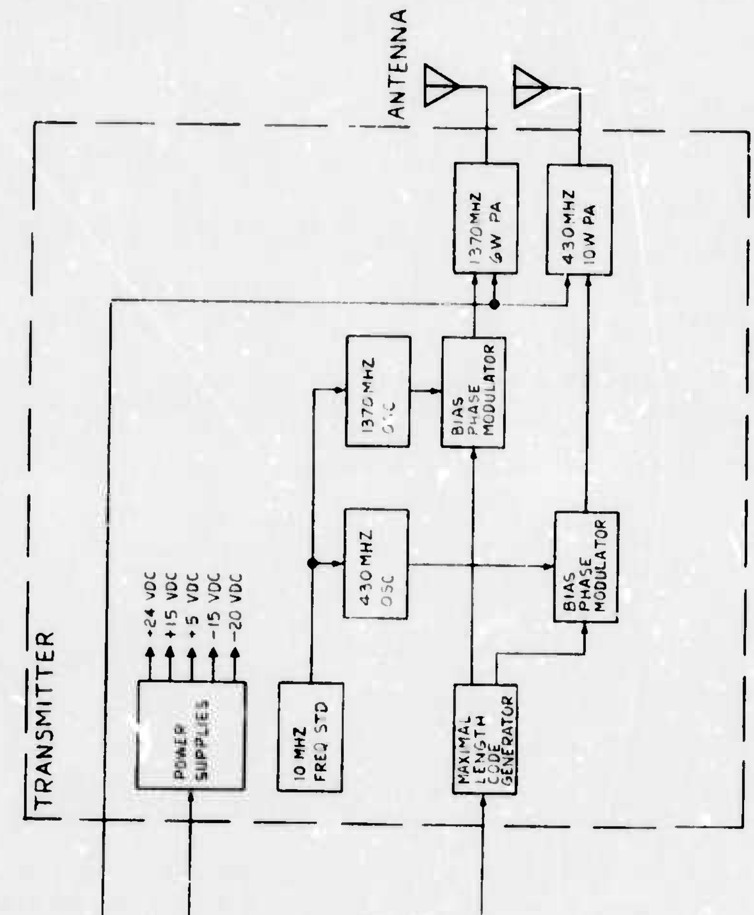


Figure 4-1. Transmit System Block Diagram.

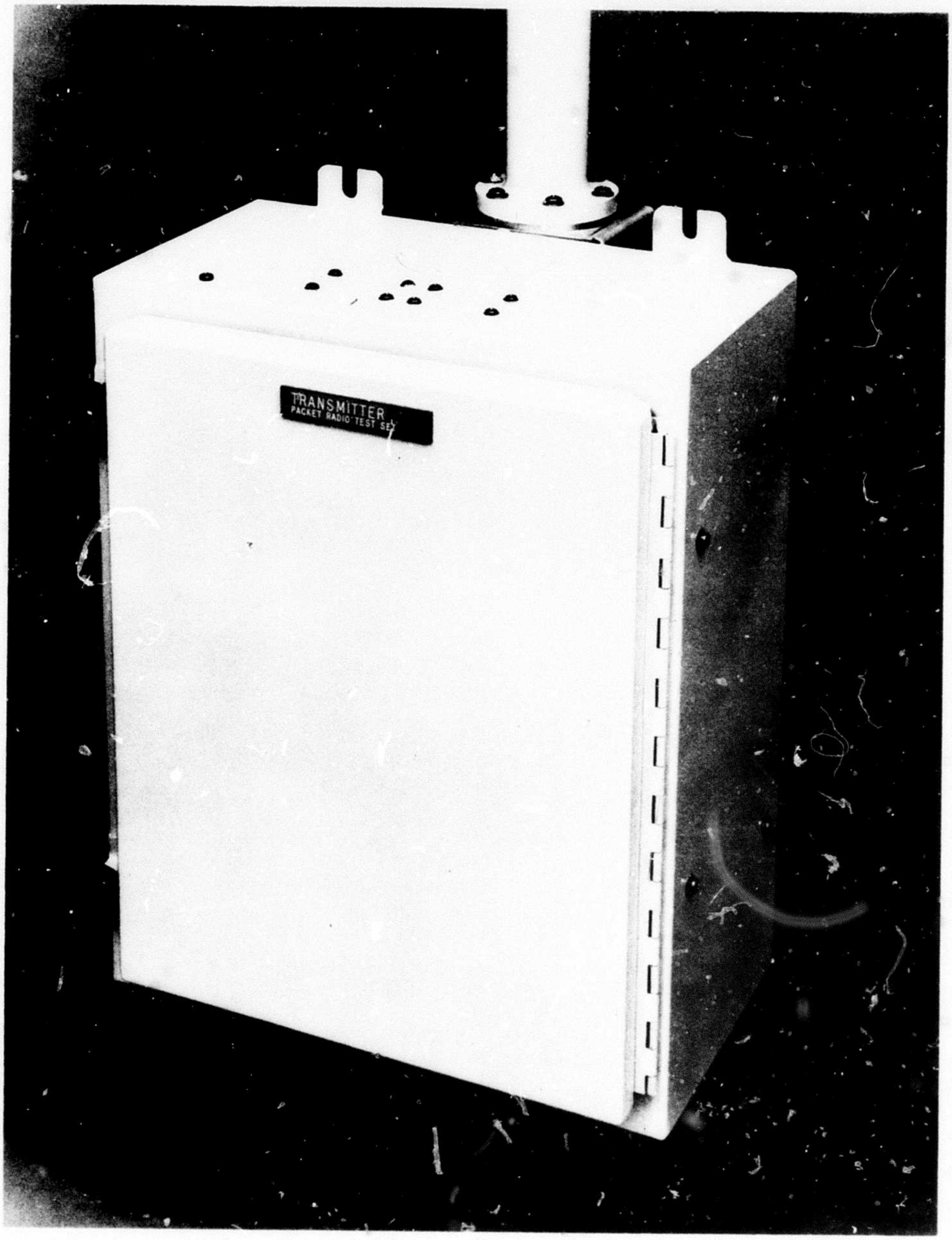


Figure 4-2. Transmitter.

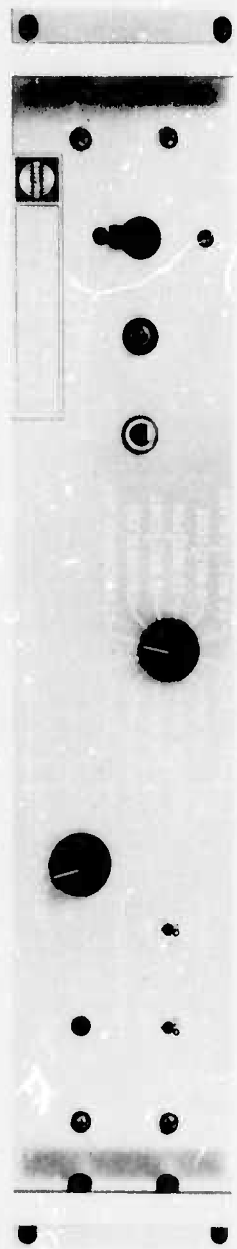


Figure 4-3. Transmitter Control.

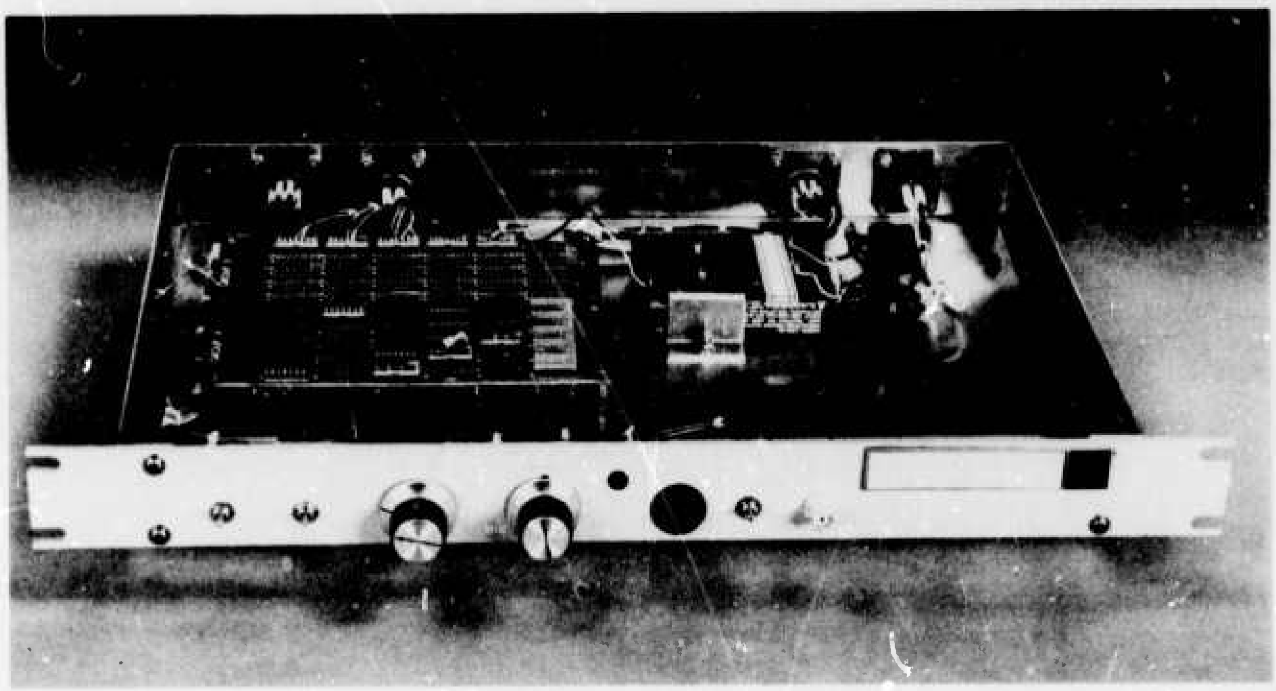


Figure 4-1. Burst Mode Control.

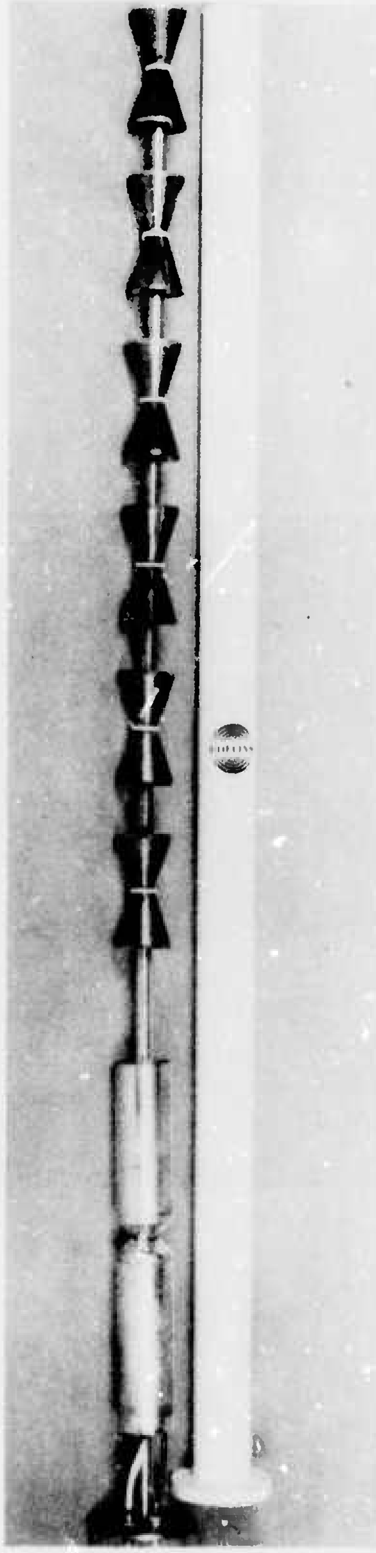


Figure 4-5. High-Gain Antenna.

4.2.3 Receiver Characteristics

Figure 4-6 shows the receive system block diagram. Figure 4-7 shows the front panel of the receiver which is arranged to aid an operator in understanding the signal flow without studying the schematics or detailed system diagrams. Maximum flexibility is provided at the receive front panel to monitor signals or inject signals. The 10-MHz frequency standard is available for reference input to an external synthesizer that can be used to generate injection frequencies for the down-converters. The if. is available to be used with a spectrum analyzer to monitor the received signal and interference. The receiver outputs are available at the rear of the unit and also available on the front panel.

The receive system antenna is a low-gain, colinear, dipole antenna with separate dipoles for 430 MHz and 1370 MHz. Each dipole yields a 2-dBi gain. The antenna construction is shown in figure 4-8.

Each receive frequency has its own rf front end consisting of a 3-pole, 50-MHz bandwidth filter and a low-noise rf amplifier. The down converters are double balanced mixers followed by 140-MHz if. preamplifiers. The receive channel select function chooses if. preamplifier output is selected for detection. When the selection is made, power to the rf amplifier and if. preamplifier of the unselected frequency is turned off.

The if. bandwidth can be either 50 MHz or 500 kHz. If the 500-kHz bandwidth is selected, gain is added in the if. switching module to compensate for reduced noise bandwidth. As a result, the noise threshold detectors operate at a fixed level of spectral density independent of the bandwidth setting.

The if. agc amplifier maximum gain is > 60 dB and can be adjusted manually or by agc for -13-dBm output. This gain plus the front end gain of approximately 30 dB allows thermal noise to be amplified to the -13-dBm level, thereby providing adequate gain for any usable signal.

The SAWD correlators provide approximately 20 dB of processing gain so that 0 dB input signal-to-noise levels will provide useful output. The if. frequency is actually 139.98 MHz due to the manufacturing tolerance of the SAWD's. The detector has a 13-dB linear dynamic range from the maximum output level of approximately 5.0 volts peak. The detector output impedance is 50 ohms.

The doppler test function compares a received CW signal converted to 140 MHz if. and a 140-MHz frequency obtained from a local oscillator phase locked to the precision 10-MHz frequency standard. The frequency standard can be manually synchronized with the transmitter frequency standard or locked through a very slow phase-lock loop for short period doppler measurements. The bandwidth for measuring doppler is approximately 100 Hz.

The down-converter injection frequencies are also phase locked to the precision 10-MHz standard.

The threshold detector consists of six stages of amplification at 140 MHz. Each amplifier has a detector and comparator that will level detect noise impulses of less than 0.1 μs in duration. Each stage adds 10 dB of gain so that 0 to -50-dB levels in 10-dB steps are detected. Since the radio gain preceding this module is approximately 30 dB, noise impulses from -30 to -80 dBm can be monitored. The detector outputs are differential MECL integrated circuits. A secondary output allows the detected outputs to be monitored on the front of the receiver. This is of value for threshold level calibration.

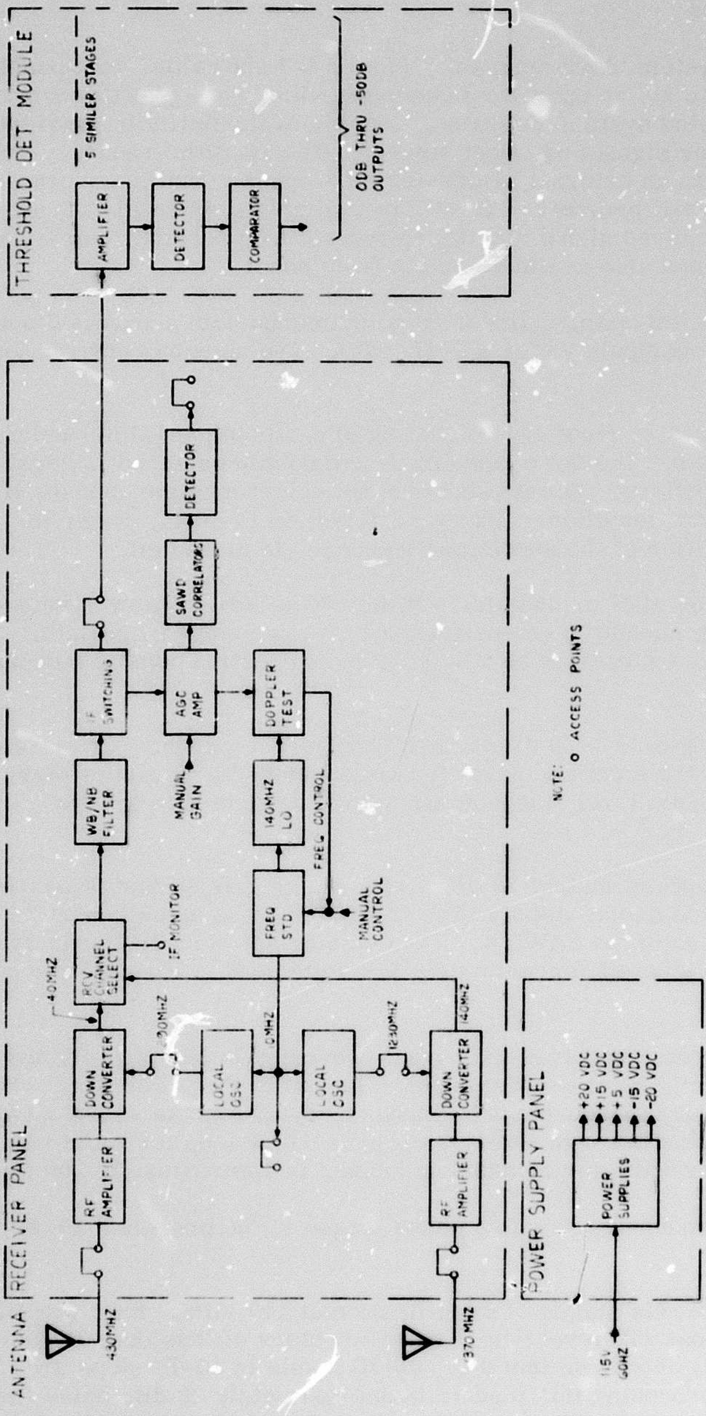


Figure 4-6. Receiver System Block Diagram.

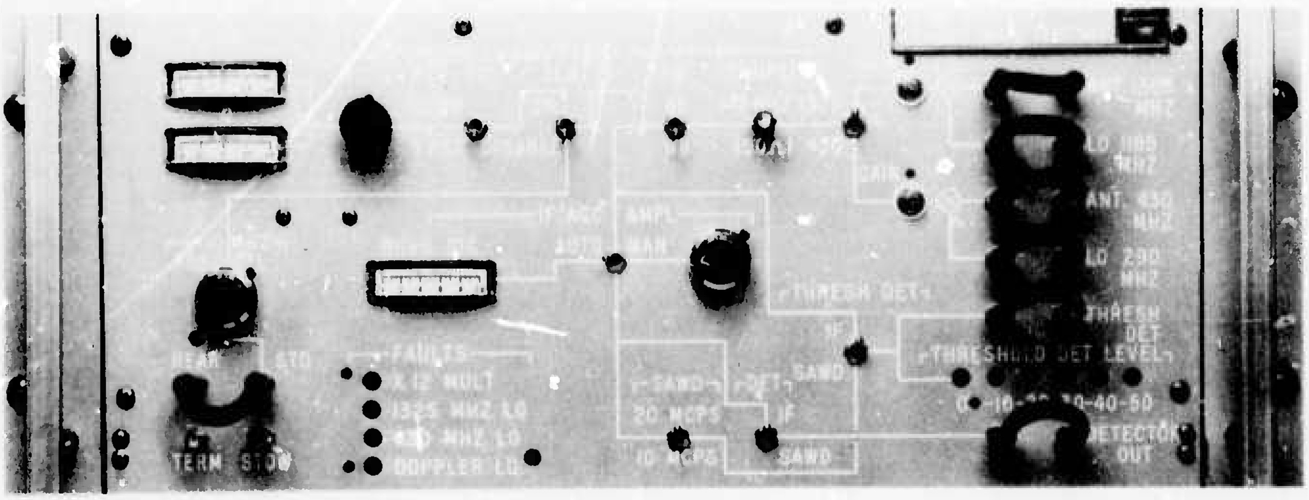


Figure 4-7. Receiver System Front Panel.

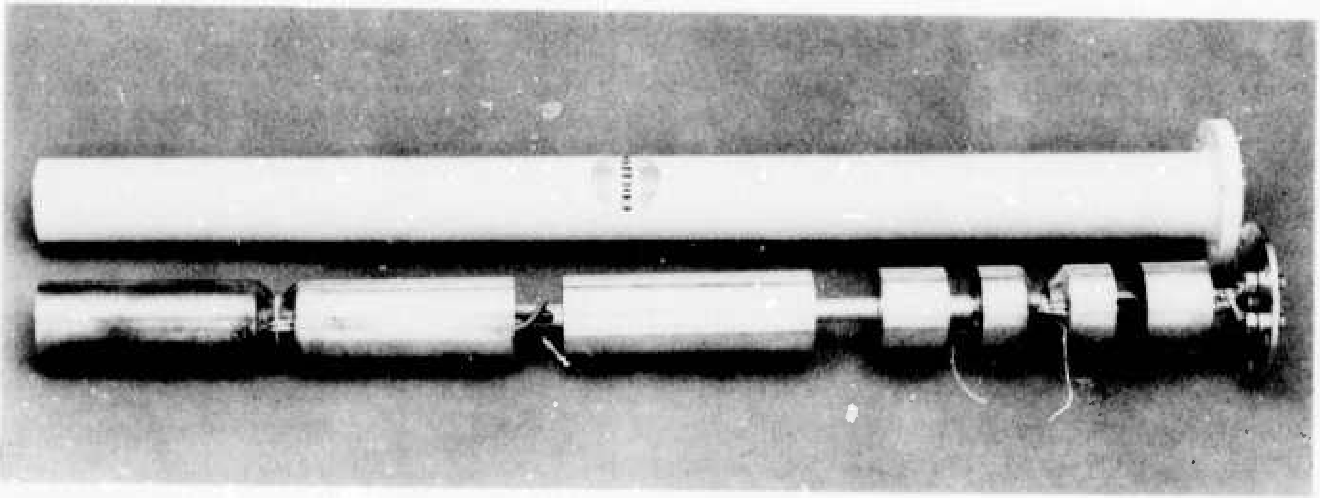


Figure 4-8. Low Gain Antenna Construction

4.2.4 Specification Summary

TRANSMITTER AND CONTROL

Frequency Bands	-430 MHz and 1370 MHz
Output Power	-430 MHz — 10W -1370 MHz — 6W
Output Filters	2 Pole 40 MHz BW centered on output frequencies
Modulation	Biphase at a 10 M-chip or 20 M-chip rate
Frequency Stability	All frequencies locked to 10-MHz standard
Aging Rate	$<5 \times 10^{-10}$/day after 24 hour warmup
Stability	1×10^{-11} for 10 seconds average time
Temp Coefficient	$< 1 \times 10^{-9}$ over 0 to 70°C.
Warmup	Within 5×10^{-9} of final frequency in 15 minutes after turnon at 25°C
Data Rate	78.74 kb/s and 156.48 kb/s
Coding	127 chip maximal length code
Input Power	115V 60 Hz
Controls (Front Panel)	
Power	On-Off
430 MHZ PA	On-Off
1370 MHZ PA	On-Off
Mode Control	

ABCD	CONTROL OPTIONS
TTL LEVEL CONTROL INPUT	RESPONSE
0000	STANDBY, CARRIER OFF
0001	140MHZ CW (DOPPLER)
0010	CONTINUOUS PRN, 10 MHZ
0011	CONTINUOUS PRN, 20 MHZ
0100	CODE/1 BLANK, 10MHZ
0101	CODE/1 BLANK, 20MHZ
0110	CODE/3 BLANK, 10MHZ
0111	CODE/3 BLANK, 20MHZ
1000	CODE/1 CARRIER, 10MHZ
1001	CODE/1 CARRIER, 20 MHZ
1010	CODE/3 CARRIER, 10MHZ
1011	CODE/3 CARRIER, 20MHZ

Local Remote Mode Selection

Indicators (Front Panel)	Power On
	Fault Summary
	Note — The control panel fault is a loss of phase lock of any of the phase-locked loops. Individual loop indicators are inside the transmitter cabinet
Antenna(s)	High gain omni colinear must
	1370 MHz 9 dBi 430 MHz 2 dBi
	Optional antennas
	A directional 10-dBi horn for 1370 MHz was provided to SRI
	A 2 dBi low-gain antenna same as the receiver antenna was also provided.

BURST CONTROL PANEL

Note that this panel is required only if the system is to be operated in the burst mode. The cables from the transmitter will connect directly to the control panel or can be fed through the burst mode control.

Power	115V 60 Hz
Repetition Rate	0.25 Hz to 20 Hz (continuously variable)
Burst Duration(s)	20, 40, 80, 160, 1000, and 5000 μs
Controls (Front Panel)	Repetition rate
	Burst duration
	Mode(s) Cycle or single burst Normal or burst mode
	Sync button which initiates single burst
	Sync internal — external
Indicator (Front Panel)	Rate light that shows when transmitter enabled.

RECEIVER

Receive Signal Range	0 to -90 dBm
Frequency Bands	430 MHz and 1370 MHz

RF Filters	3 pole 50 MHz BW centered on receive frequencies
RF Amplification	> 12 dB (noise figure < 3.5 dB)
Receiver Noise Figure	< 8 dB
IF. Frequency	139.980 MHz
IF. Gain	> 60 dB
Demodulation and Decoding	10 M-chip and 20 M-chip SAWD's; 127-chip maximal length code biphase modulation construction
Processing Gain	20 dB
Frequency Stability	Same as transmitter For doppler tests, the frequency standard can be electrically shifted ≥ 1 x 10^{-7} ppm
Doppler Test Bandwidth	100 Hz
Input Power	115V 60 Hz
Outputs	10 MHz frequency standard 0 dBm 50Ω IF output (Input signal level plus approximately 30-dB gain, 50 Ω) Detected signal out 5V peak from 50 Ω source Analog agc level (0 to +15V) Doppler I&Q outputs (each 0 ± 5V)
Controls (Front Panel)	
Gain	To balance rf receive level of 430 MHz and 1370 MHz
Bandwidth Selection	50 MHz or 500 kHz
AGC Amplifier	Automatic (-13 dBm output) or manual.
Manual AGC Gain	10 turn pot for > 60-dB range
SAWD	Selects output from 20 M-chip or 10 M-chip SAWD
Detector	Selects whether the if. or SAWD output will be detected
Threshold Detector	IF-SAWD Only the if. signal is now available for switching. The SAWD signal is available at the STOW SMA connector and can be patched to the threshold detector.

	10-MHz Frequency Control	Shifts 10-MHZ frequency standard
	Doppler Test	In ON position causes doppler unit to control the 10 MHz frequency standard to obtain synchronization with transmitter.
	10-MHz Phase	This controls the phase lock angle after doppler synchronization.
	ØLL Time Constant	Controls setting time, of synchronization
Indicators (Front Panel)		Doppler I&Q channels
		Receive Signal Strength — Only operational in auto agc mode
		Faults — Loss of phase lock for the receiver loops
		Threshold Detector — Sense monitors
Threshold Detector		0 to -50-dBm range in 10-dB steps
		Output — Differential MECL levels for each 10-dB level detector
		Response time < 20 ns
Antenna		Colinear 430-MHz and 1370-MHz dipoles each 2-dBi gain

A.1 INTRODUCTION

This appendix contains pictures of the test set and detailed schematics of the equipment. The pictures reflect a variety of construction techniques from printed circuit cards to brass board type modules. This construction is not Collins normal practice, but was the most cost-conscious and efficient means to provide a usable one-of-a-kind test set in a minimum amount of time. The schematics represent the circuits as they exist as of this report. The pictures and schematics are felt to be self-explanatory and are thus presented without narrative in the order shown in the index for this appendix.

NOTE

In some cases, 1325 MHz and 1370 MHz are both shown in the documentation. Due to coexistence problems at 1325 MHz, the test set frequency was changed to 1370 MHz. Any reference to 1325 MHz should be interpreted as being the 1370-MHz channel.

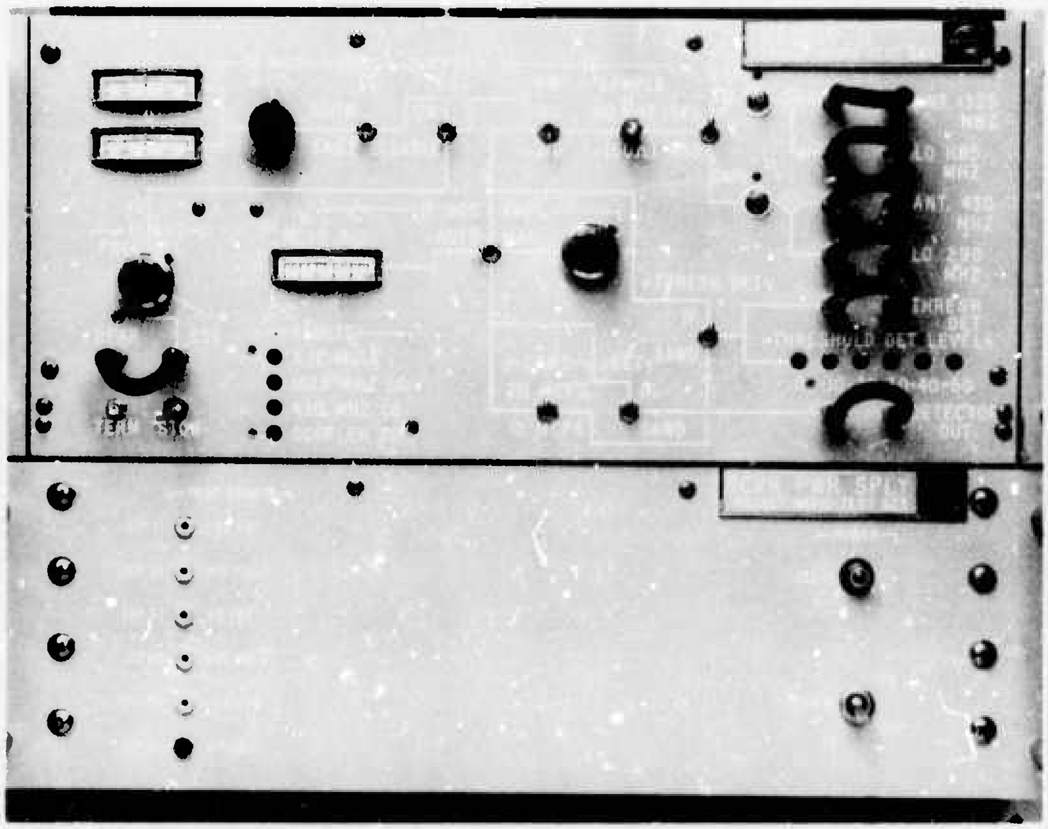
INDEX

INDEX (Cont)

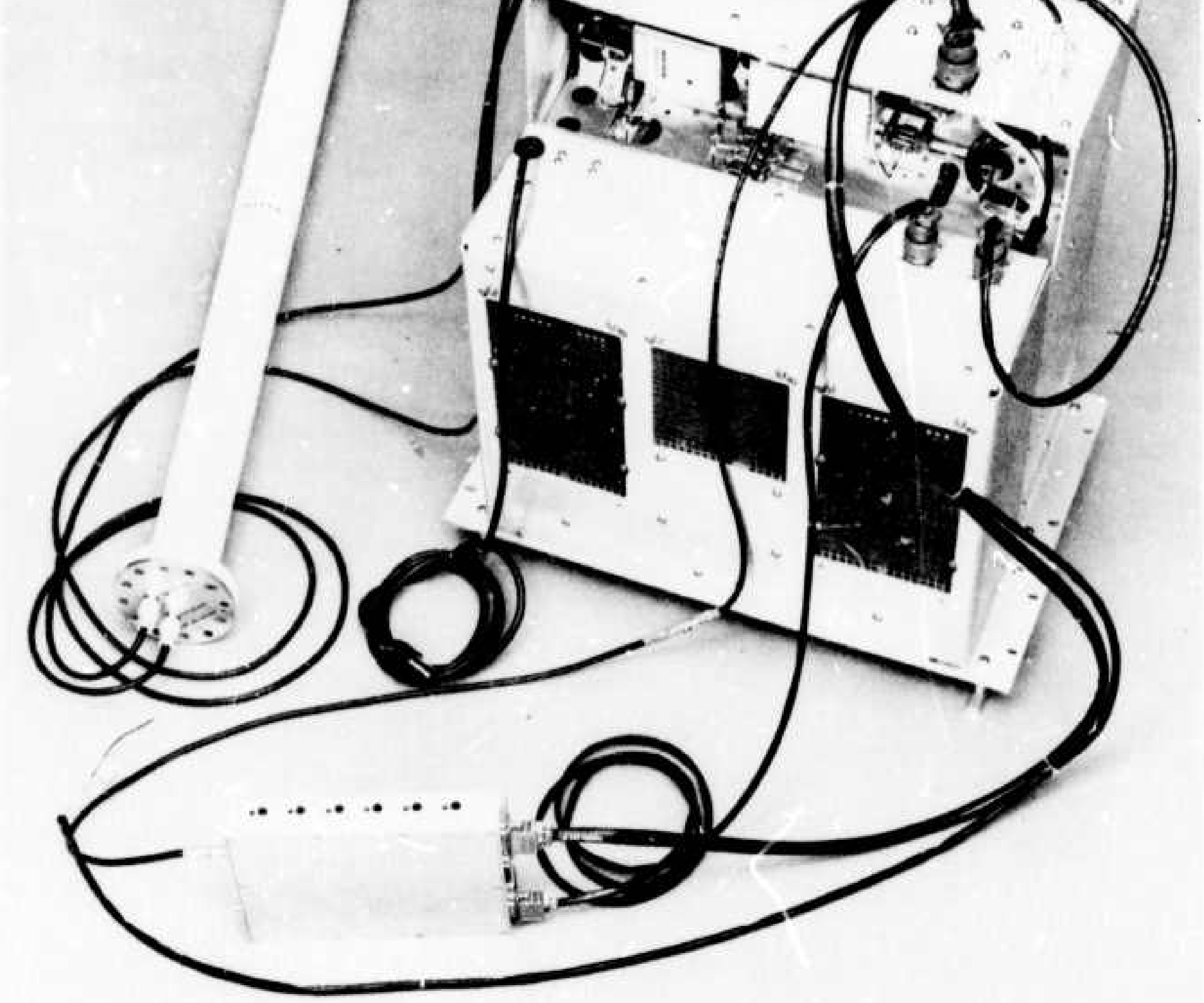
INDEX (Cont)

INDEX (Cont)

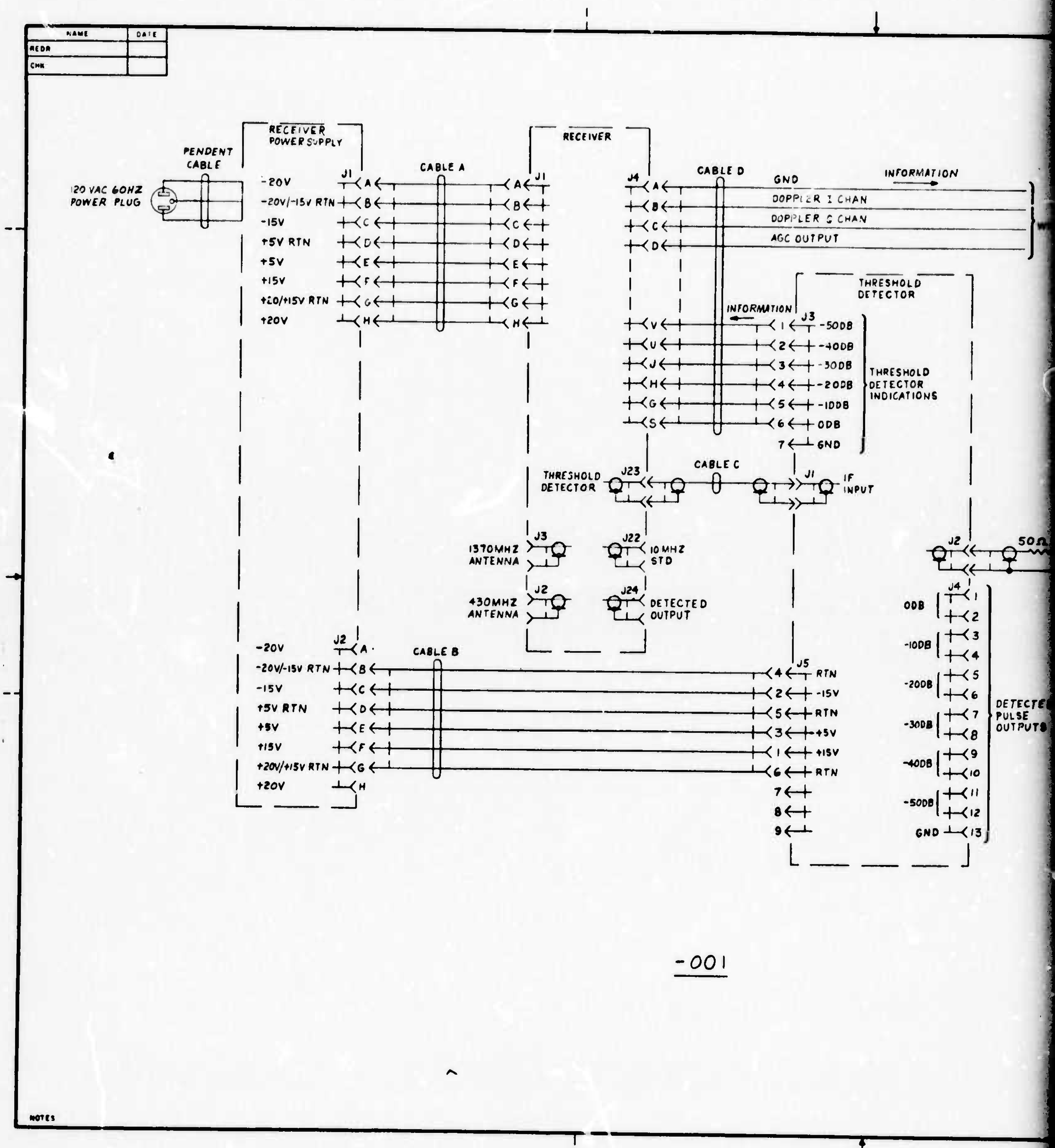
*1370 MHz.



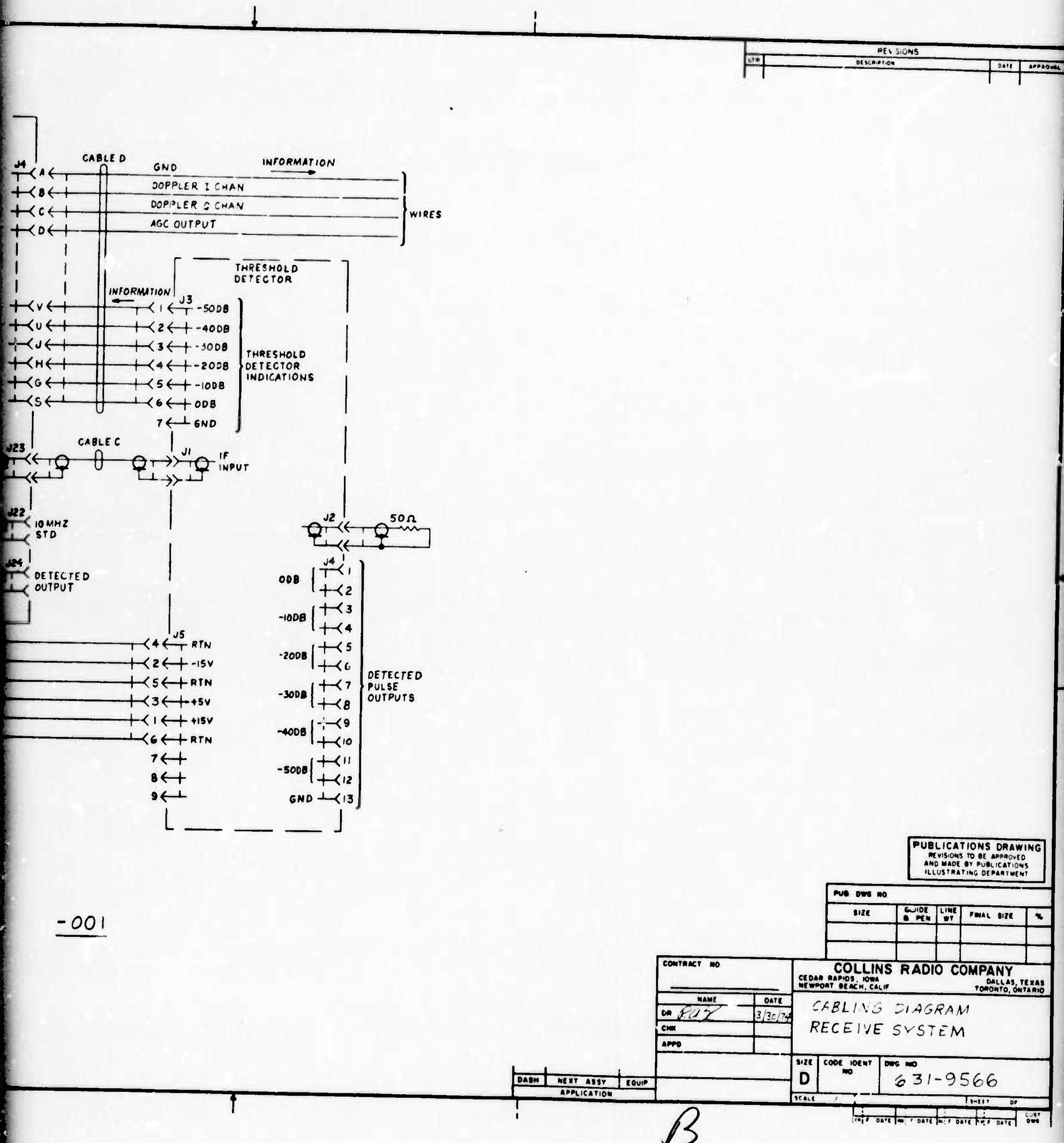
Front View RCVR & PS



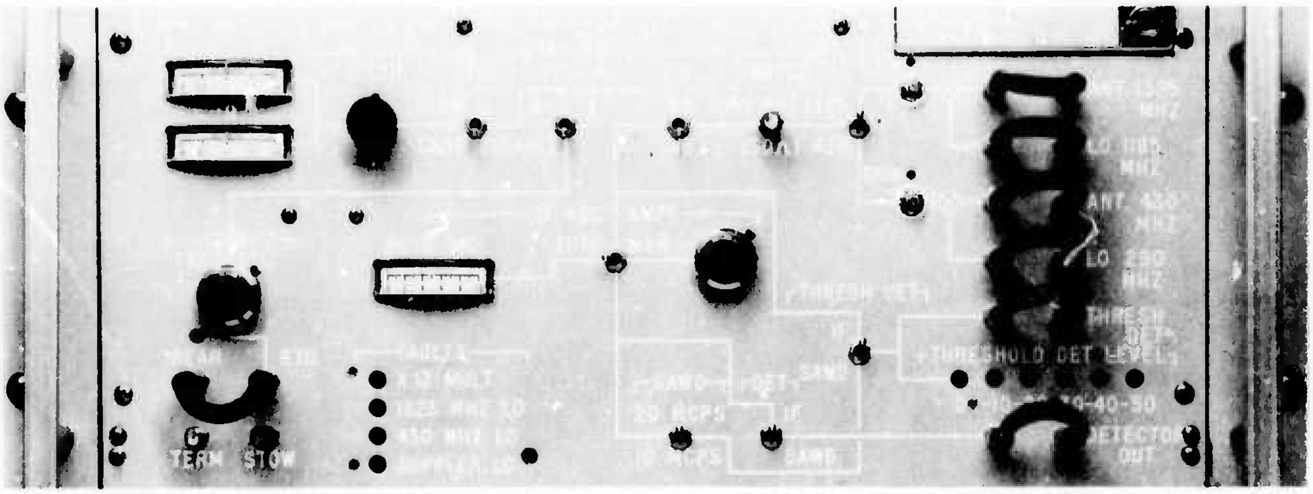
Receiver System


NAME
DATE
REDR
CHK
PENDENT CABLE
120 VAC 60HZ POWER PLUG
RECEIVER POWER SUPPLY
J1
-20V
-20V/-15V RTN
-15V
+5V RTN
+5V
+15V
+20/+15V RTN
+20V
CABLE A
RECEIVER
CABLE D
GND
DOPPLER I CHAN
DOPPLER Q CHAN
AGC OUTPUT
INFORMATION
THRESHOLD DETECTOR
J3
-50DB
-40DB
-30DB
-20DB
-10DB
0DB
GND
THRESHOLD DETECTOR INDICATIONS
J23
CABLE C
IF INPUT
1370MHZ ANTENNA
10 MHZ STD
430MHZ ANTENNA
DETECTED OUTPUT
J22
J24
J2
CABLE B
J5
RTN
-15V
+5V
+15V
50Ω
J4
DETECTED PULSE OUTPUTS
NOTES
-001

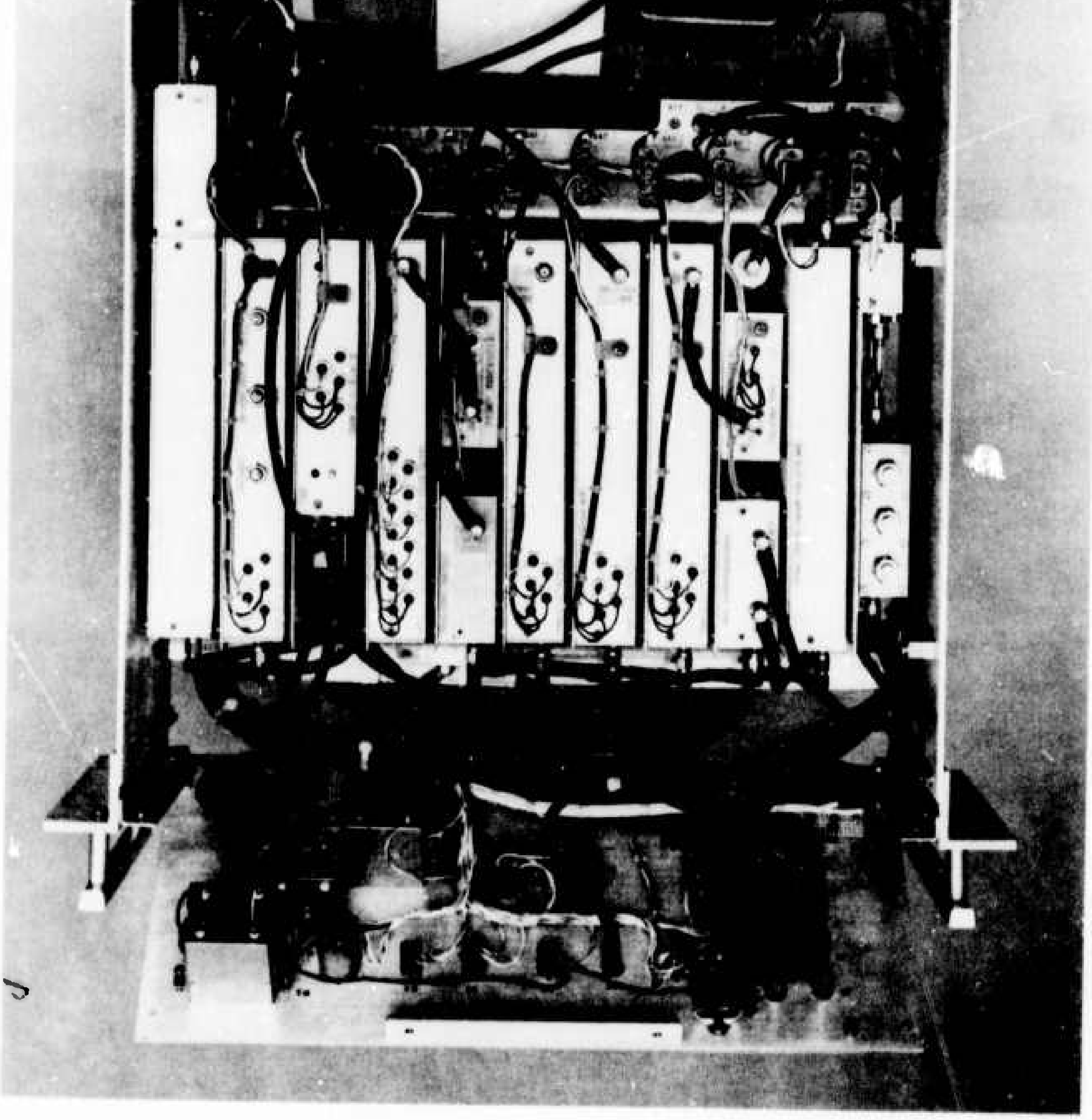
A



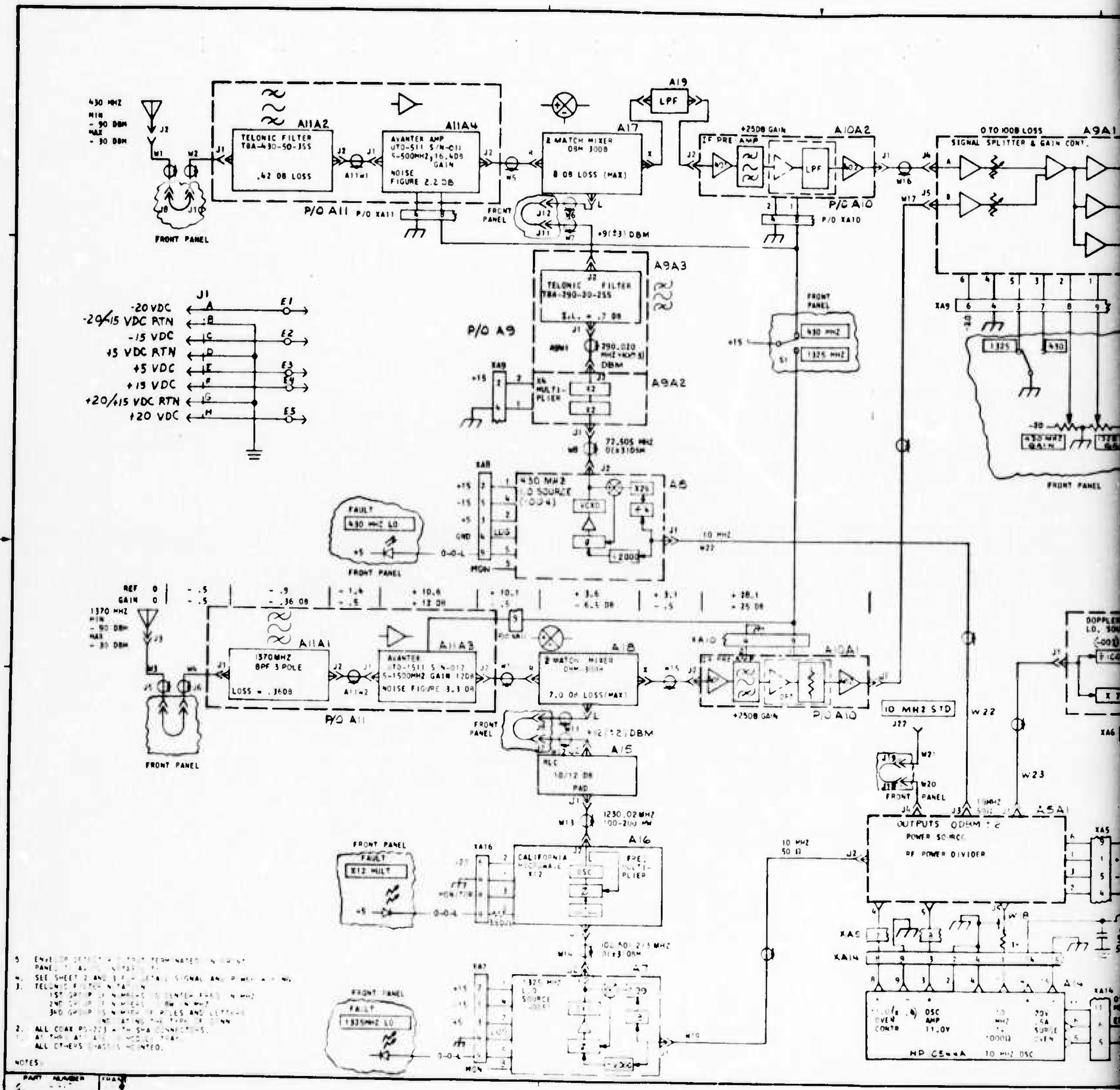
REVISIONS
LTR
DESCRIPTION
DATE
APPROVAL
J4
CABLE D
GND
INFORMATION
DOPPLER I CHAN
DOPPLER Q CHAN
AGC OUTPUT
WIRES
A
B
C
D
THRESHOLD DETECTOR
INFORMATION
J3
V
U
J
H
G
S
-50DB
-40DB
-30DB
-20DB
-10DB
0DB
GND
THRESHOLD DETECTOR INDICATIONS
J23
CABLE C
J1
IF INPUT
J22
10 MHZ STD
J24
DETECTED OUTPUT
J2
50Ω
J4
0DB
-10DB
-20DB
-30DB
-40DB
-50DB
GND
DETECTED PULSE OUTPUTS
J5
RTN
-15V
RTN
+5V
+15V
RTN
-001
PUBLICATIONS DRAWING
REVISIONS TO BE APPROVED AND MADE BY PUBLICATIONS ILLUSTRATING DEPARTMENT
PUB DWG NO
SIZE
GUIDE & PEN
LINE WT
FINAL SIZE
%
CONTRACT NO
NAME
DATE
DR
3/30/74
CHK
APPD
COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA
NEWPORT BEACH, CALIF
DALLAS, TEXAS
TORONTO, ONTARIO
CABLING DIAGRAM
RECEIVE SYSTEM
SIZE
D
CODE IDENT NO
DWG NO
631-9566
SCALE
SHEET
OF
DASH
NEXT ASSY
EQUIP
APPLICATION
B



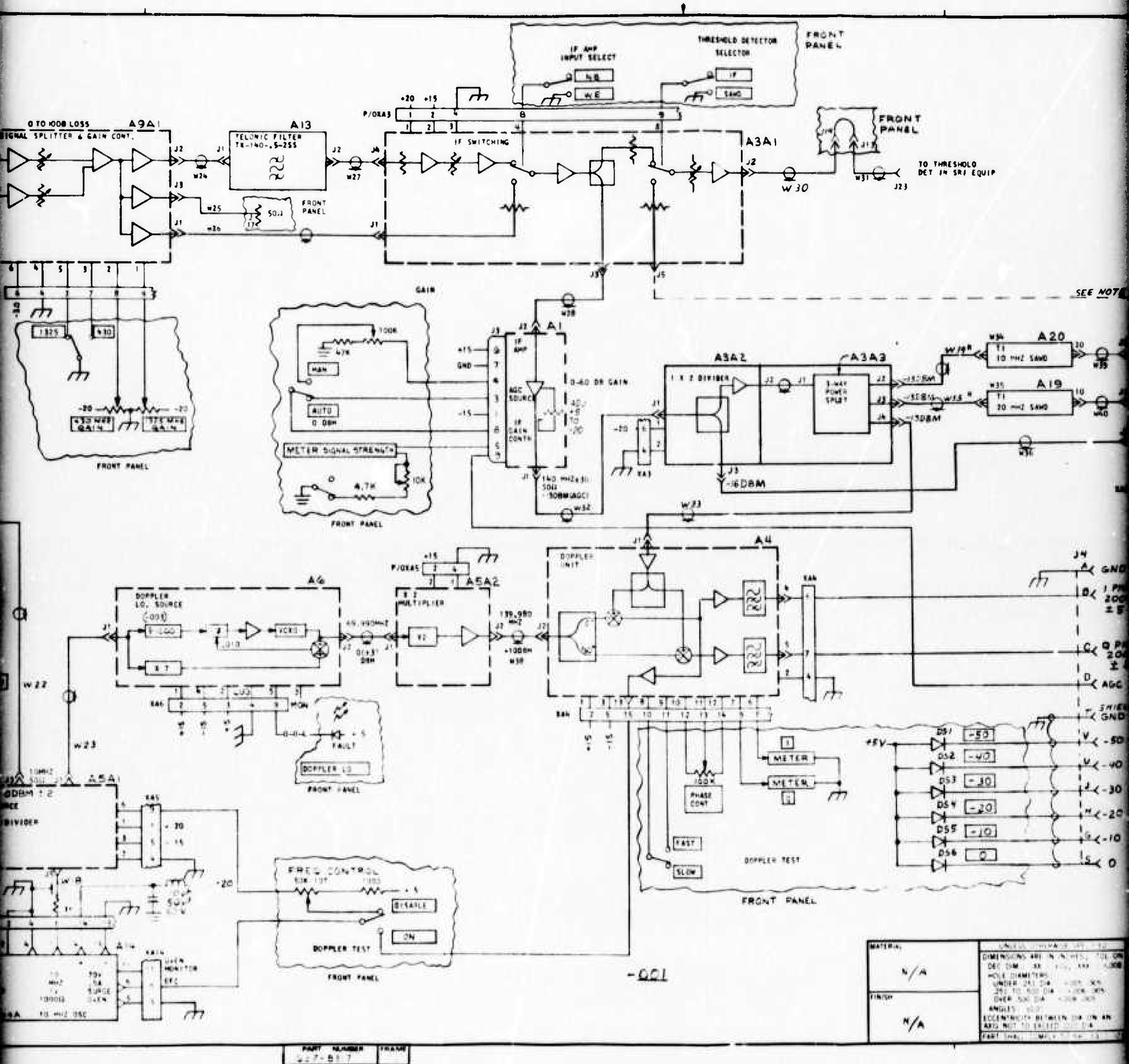
Front Panel



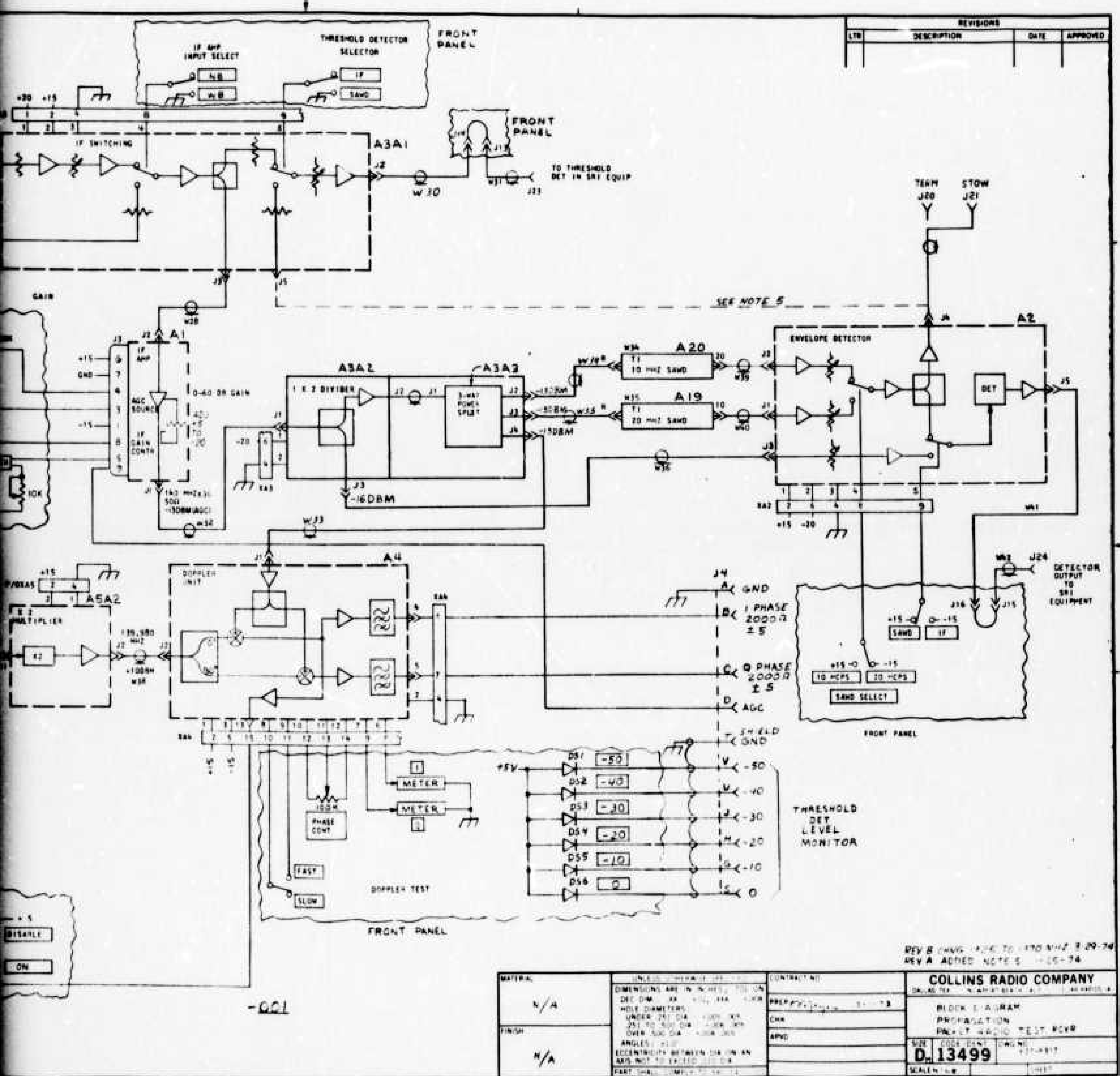
Internal Assemblies


430 MHZ
FRONT PANEL
TELONIC FILTER
TBA-430-50-3SS
.42 DB LOSS
A11A2
AVANTEK AMP
NOISE FIGURE 2.2 DB
A11A4
P/O A11
A17
A19
LPF
IF PRE AMP
+25DB GAIN
A10A2
P/O A10
0 TO 100DB LOSS
SIGNAL SPLITTER & GAIN CONT.
A9A1
8 DB LOSS (MAX)
+9(±3) DBM
A9A3
TELONIC FILTER
TBA-290-20-2SS
P/O A9
A9A2
72.505 MHZ
430 MHZ
1325 MHZ
J1
-20 VDC
-20/-15 VDC RTN
-15 VDC
+15 VDC RTN
+5 VDC
+15 VDC
+20/+15 VDC RTN
+20 VDC
E1
E2
E3
E4
E5
430 MHZ LO SOURCE
A8
FAULT
430 MHZ LO
10 MHZ
REF
GAIN
1370 MHZ
1370MHZ
BPF 3 POLE
A11A1
AVANTEK
NOISE FIGURE 3.3 DB
A11A3
A18
7.0 DB LOSS(MAX)
P/O A10
+25DB GAIN
A10A1
P/O A11
DOPPLER
10 MHZ STD
W22
W23
A15
PAD
1230.02 MHZ
A16
CALIFORNIA
X12
FRONT PANEL
FAULT
X12 MULT
A5A1
OUTPUTS
POWER SOURCE
RF POWER DIVIDER
XA5
XA14
A7
FAULT
1325MHZ LO
OSC
HP C544A
10 MHZ OSC
NOTES:

A


FRONT PANEL
IF AMP INPUT SELECT
THRESHOLD DETECTOR SELECTOR
NB
WB
IF
SAWD
0 TO 100B LOSS
A9A1
SIGNAL SPLITTER & GAIN CONT.
A13
TELONIC FILTER TK-140-.5-2SS
IF SWITCHING
A3A1
TO THRESHOLD DET IN SRI EQUIP
W24
W27
W30
W31
J23
W25
W26
50Ω
GAIN
SEE NOTE
A1
IF AMP
AGC SOURCE
IF GAIN CONTR
0-40 DB GAIN
MAN
AUTO
0 DBM
METER SIGNAL STRENGTH
4.7K
10K
100K
47K
140 MHZ±10
50Ω
-10DBM(AGC)
W32
W38
A3A2
1 X 2 DIVIDER
A3A3
3-WAY POWER SPLIT
-16DBM
XA3
A20
10 MHZ SAWD
A19
20 MHZ SAWD
W36
W33
A4
DOPPLER UNIT
A6
DOPPLER LO. SOURCE
VCXO
X 7
49.990MHZ
A5A2
X 2 MULTIPLIER
139.980 MHZ
+10DBM
W38
XA6
XA4
XA5
P/OXA5
P/OXA3
FAULT
DOPPLER LO
W22
W23
A5A1
10DBM 1:2
DIVIDER
A14
10 MHZ OSC
OVEN MONITOR
EFC
FREQ CONTROL
DISABLE
ON
DOPPLER TEST
METER
PHASE CONT
FAST
SLOW
DS1 -50
DS2 -40
DS3 -30
DS4 -20
DS5 -10
DS6 0
+5V
J4
GND
I PH
Q PH
AGC
SHIELD GND
-001
MATERIAL N/A
FINISH N/A
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES; TOL ON
HOLE DIAMETERS
ANGLES
ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED
PART NUMBER
FRAME

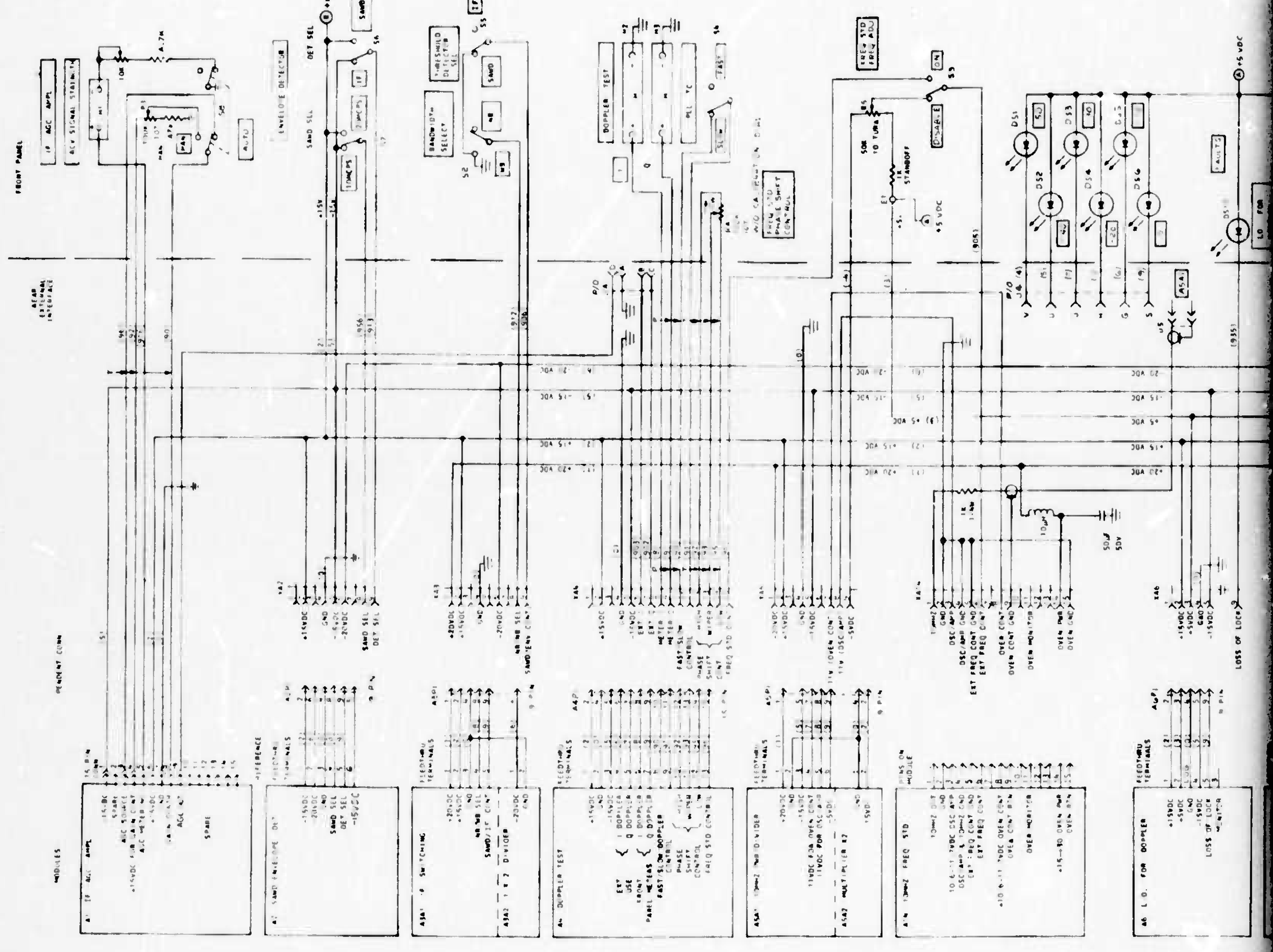
B



REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
IF AMP INPUT SELECT
NB
WB
THRESHOLD DETECTOR SELECTOR
IF
SAWD
FRONT PANEL
IF SWITCHING
A3A1
W30
TO THRESHOLD DET IN SRI EQUIP
J23
TERM
J20
STOW
J21
GAIN
SEE NOTE 5
A1
IF AMP
AGC SOURCE
IF GAIN CONTR
0-40 DB GAIN
10K
A3A2
1 X 2 DIVIDER
A3A3
3-WAY POWER SPLIT
-16DBM
A20
10 MHZ SAWD
A19
20 MHZ SAWD
A2
ENVELOPE DETECTOR
DET
W33
A4
DOPPLER UNIT
A5A2
MULTIPLIER
X2
J4
GND
I PHASE 2000Ω ±5
Q PHASE 2000Ω ±5
AGC
SHIELD GND
-50
-40
-30
-20
-10
0
DS1
DS2
DS3
DS4
DS5
DS6
+5V
METER
PHASE CONT
FAST
SLOW
DOPPLER TEST
FRONT PANEL
THRESHOLD DET LEVEL MONITOR
J24
DETECTOR OUTPUT TO SRI EQUIPMENT
SAWD
IF
10 HCPS
20 HCPS
SAWD SELECT
FRONT PANEL
DISABLE
ON
-001
MATERIAL
N/A
FINISH
N/A
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CONTRACT NO
PREP
CHK
APVD
COLLINS RADIO COMPANY
BLOCK DIAGRAM
PROPAGATION
PROJECT RADIO TEST RCVR
SIZE
D
13499
SCALE
SHEET
REV B
REV A ADDED NOTE 5

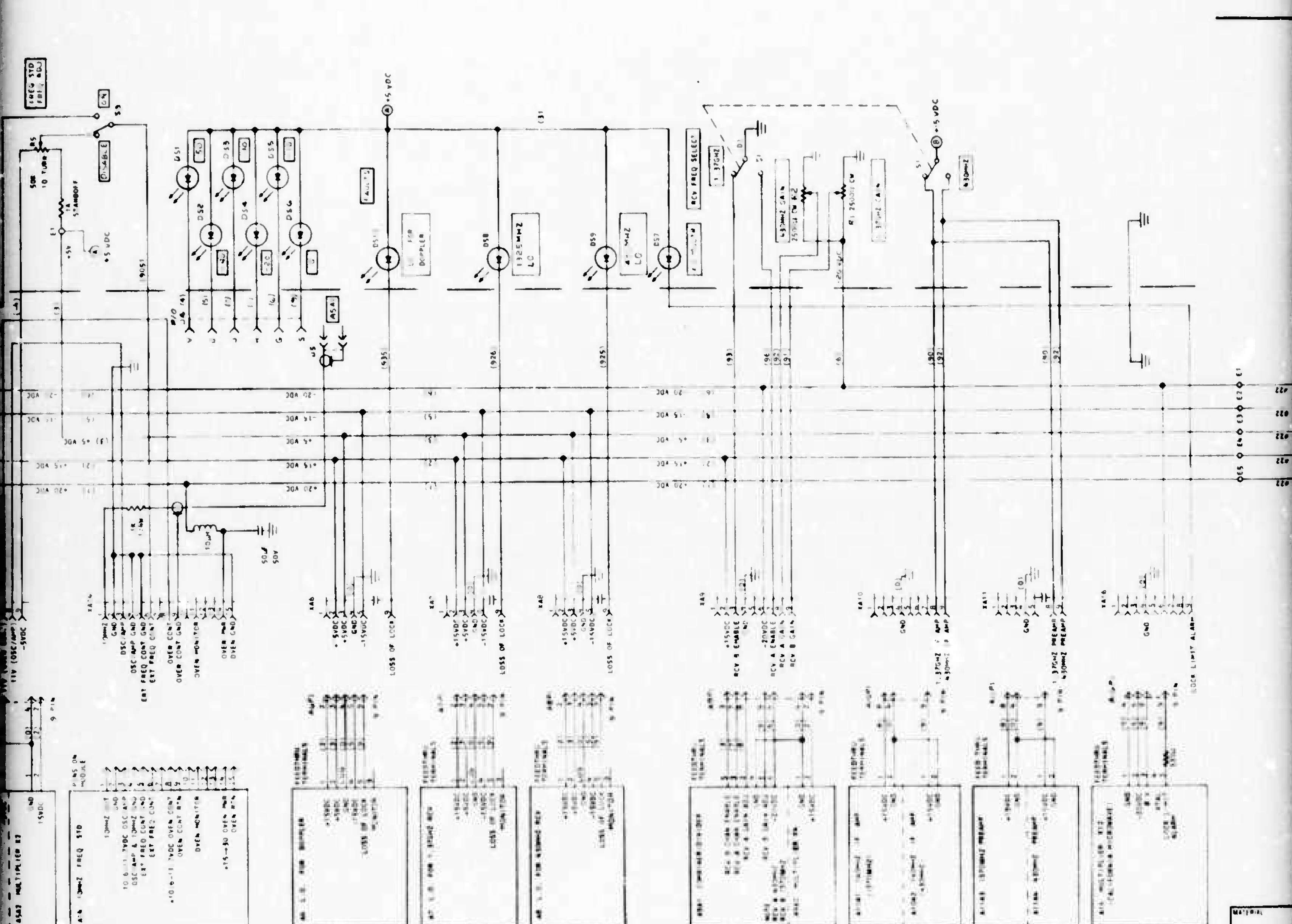
B

C



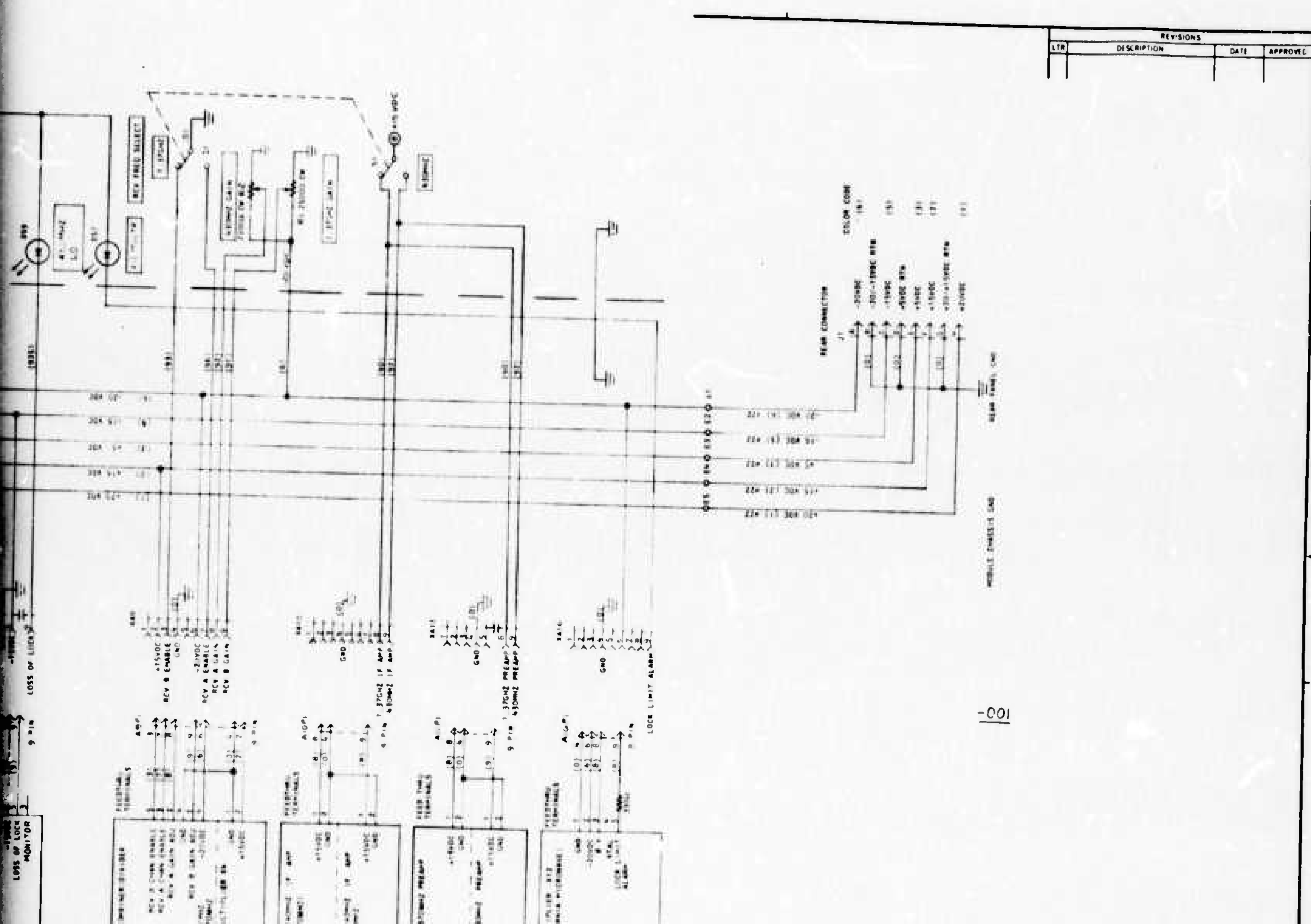
PART NUMBER	FRAME
627-9593	2/2

A



PART NUMBER	FRAME
627-9593	1/2

B



REV B CHNG 1325 TO 1370MHZ 3-22-74
REV A FD CHNG 1-25-74

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES, TOL ON DEC DIM .XX ±.02, .XXX ±.008	PREP F. MEYER 2-73	WIRING DIAGRAM RECEIVER PACKET RADIO TEST SET
FINISH	HOLE DIAMETERS UNDER .251 DIA +.005 .005; .251 TO .500 DIA +.006 .005; OVER .500 DIA +.008 .005	CHK	SIZE D, CODE IDENT 13499, DWG NO 627-9593
	ANGLES ±1.0°	APVD	SCALE NONE, SHEET
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		
	PART SHALL COMPLY TO		

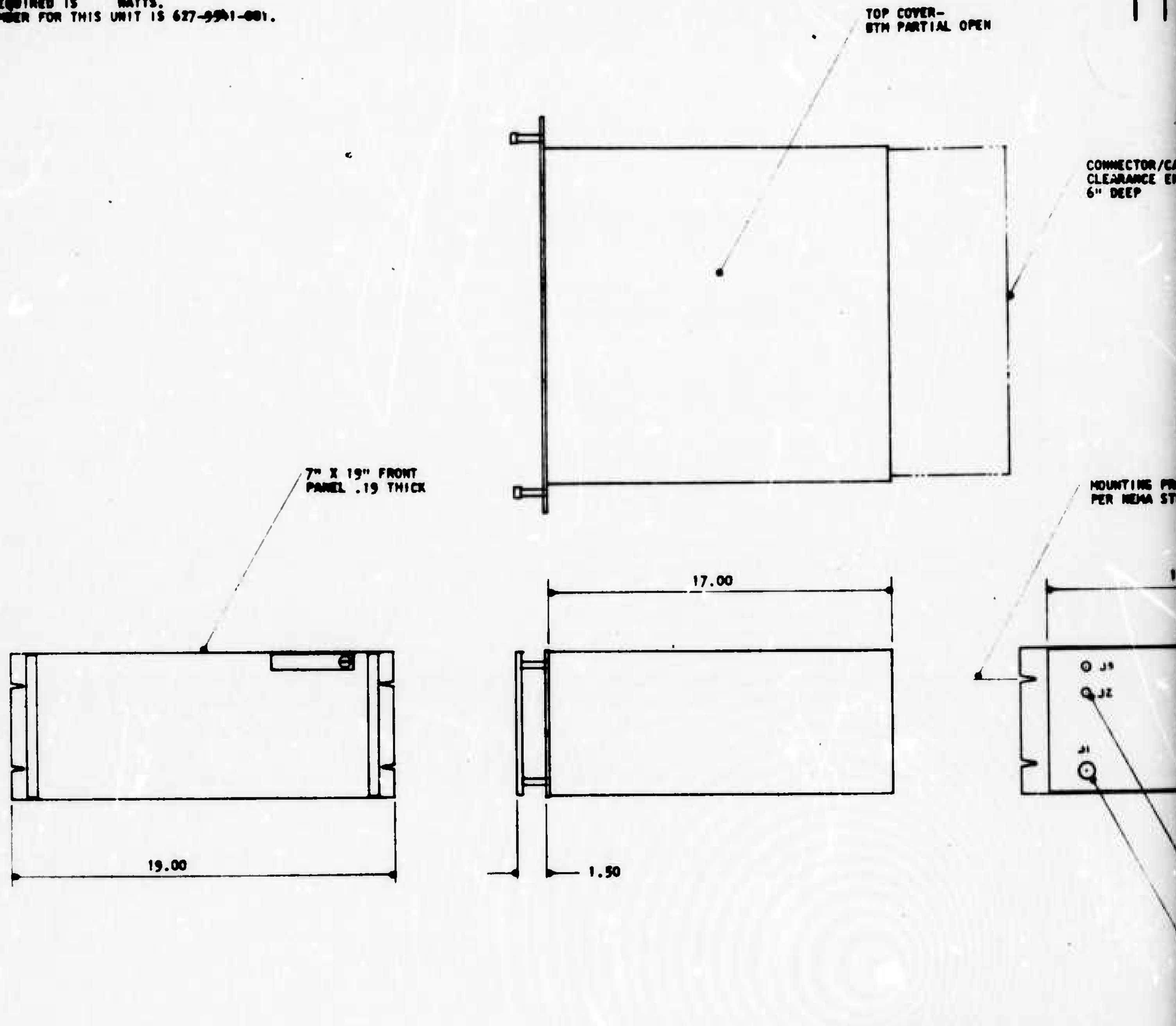
PART NUMBER	FRAME
627-9593	1/2

B

C

NOTES:

1. UNIT WEIGHT IS 30 POUNDS.
2. POWER REQUIRED IS WATTS.
3. PART NUMBER FOR THIS UNIT IS 627-9541-001.



QTY	ITEM NO.	PART OR IDENTIFYING NO.	NAME
	DASH NO.		PA

MATERIAL

N/A

FINISH

N/A

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES; TOL ON DEC DIM: .XX = ±.02, .XXX = ±.008
HOLE DIAMETERS:
UNDER .251 DIA = +.008-.005
.251 TO .500 DIA = +.006-.005
OVER .500 DIA = +.008-.005
ANGLES: ±1.0°
ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA

PART SHALL COMPLY TO 580-5400-001

CONTRACT NO.

PREP D. DELFELD 11/

CHK

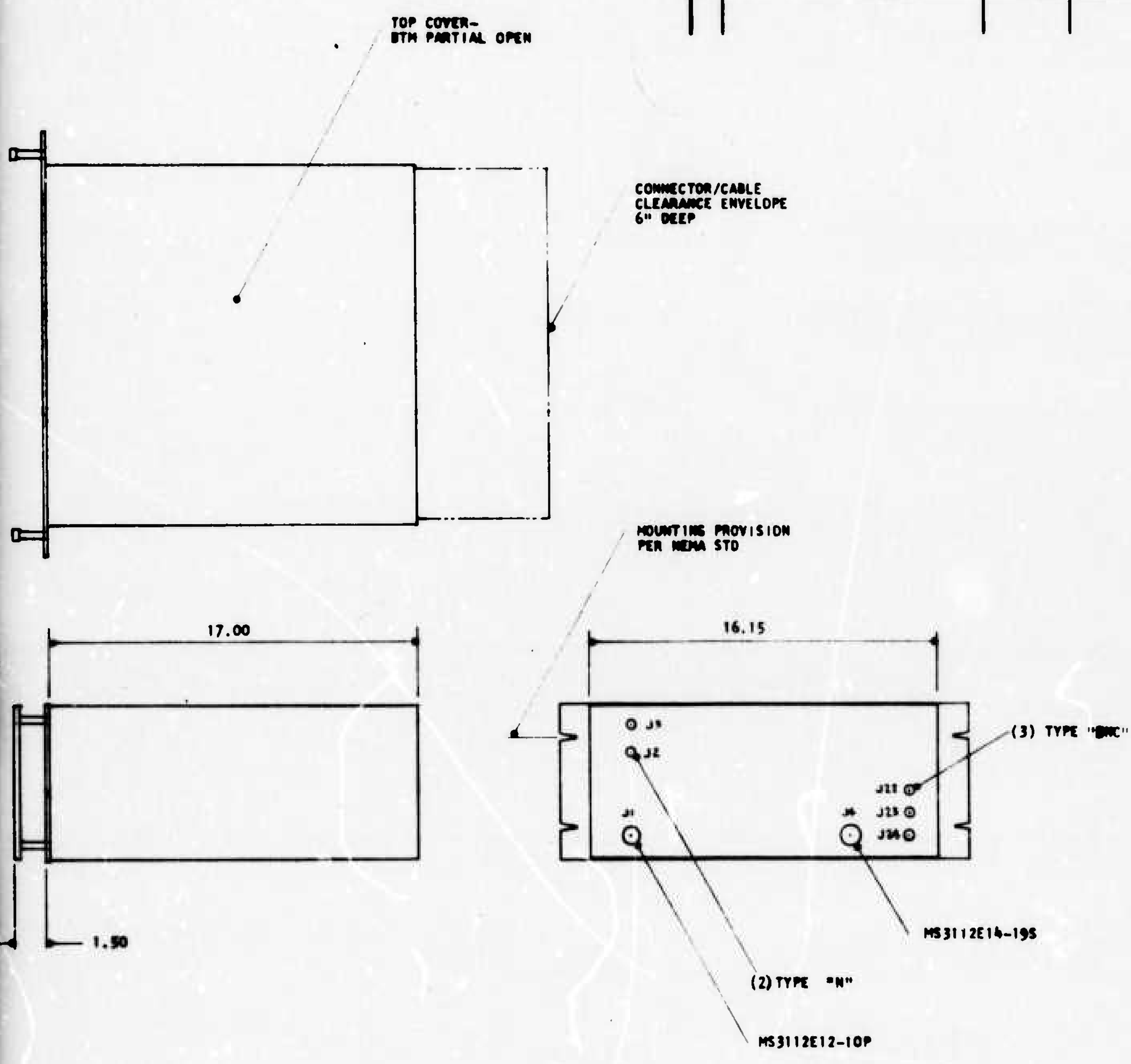
APVD R A Herrick

NEXT ASSY:

TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

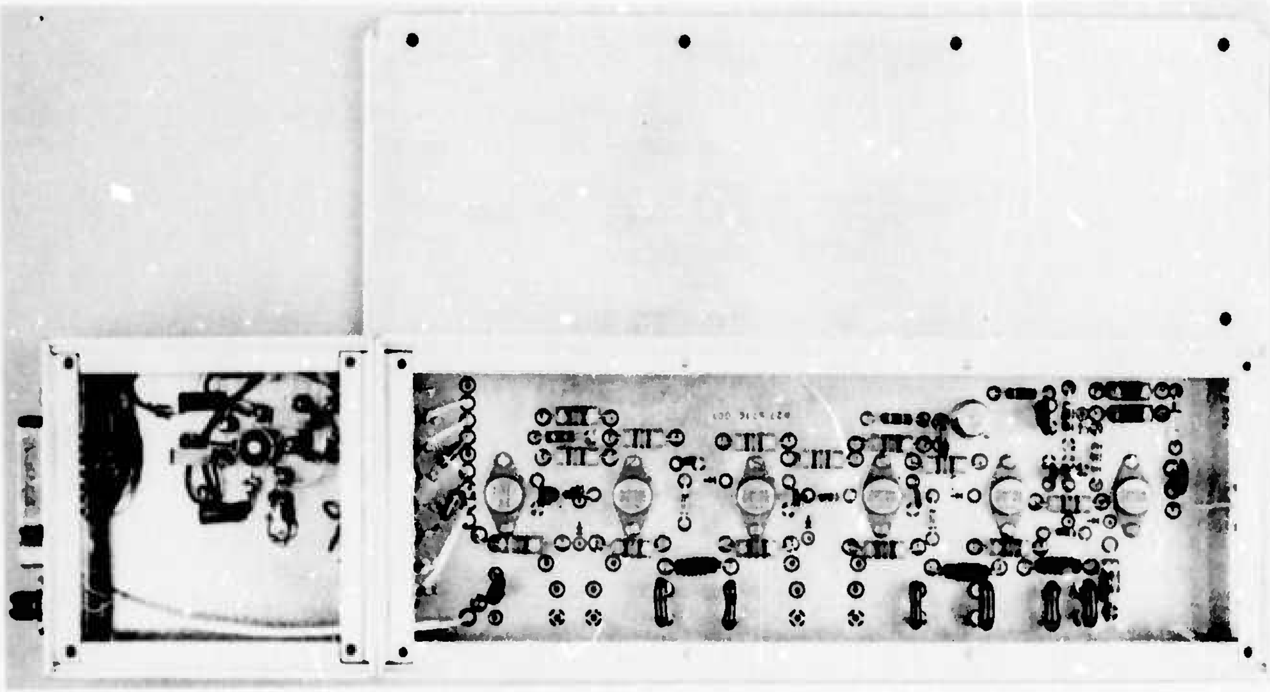


QTY	ITEM NO.	PART OR IDENTIFYING NO.	NAME	DESCRIPTION	UM	MIN	ALTN PREF
	DASH NO.	PARTS LIST					

MATERIAL N/A	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; TOL ON DEC DIM: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	CONTRACT NO.	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA
FINISH N/A	PART SHALL COMPLY TO 580-5400-001	PREP D. DELFELD 11/19/73 CHK APVD R A Herrick	RECEIVER- OUTLINE & INSTALLATION, PACKET RADIO TEST SET
			SIZE C · CODE IDENT 13499 · DWG NO 627-9576 SCALE 1/4 · SHEET

FRO ☐ NFP ☐ REL ☐ REV__ TC__ CR 0 NB 0 DL 2 TO 0

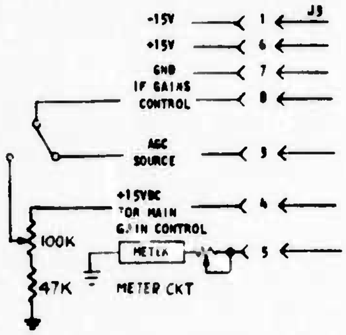
B



A1 - IF AGC AMPL.

NOTES:

NOTES:
1. TYP CONNECTION



2. GPD 401/402 BOTTOM VIEW

1. +15VDC
2. RF INPUT
3. GND
4. RF OUTPUT

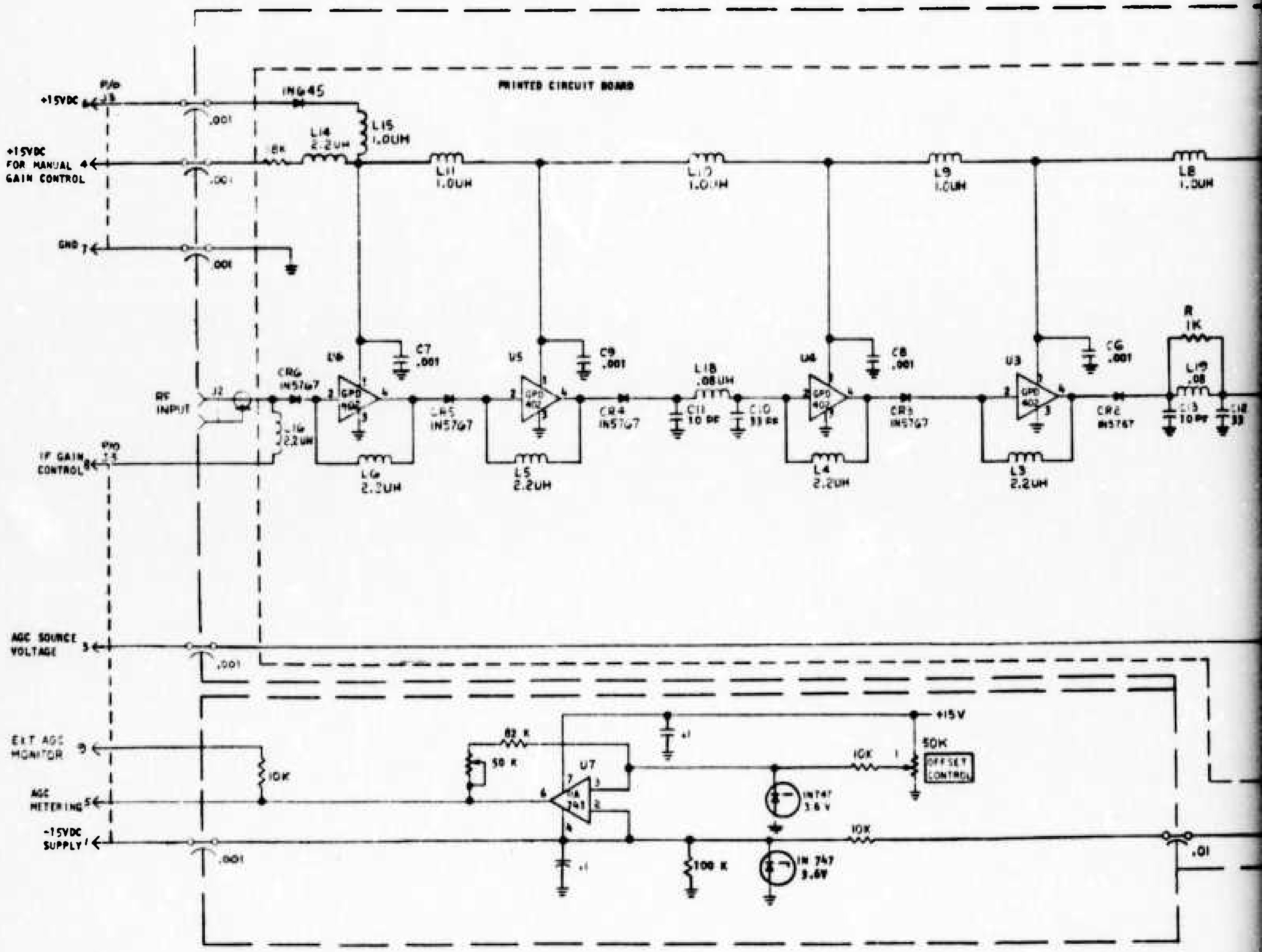
	401	402	UNITS
FREQ. RANGE	5-400	5-400	MHz
GAIN	13	13	DB
N.F.	4.5	6	DB
OUTPUT FOR 1 DB GAIN COMPRESSION	-2	+6	DBM

3. UA741 OP AMP BOTTOM VIEW

PIN
1. OFFSET NULL
2. INVERTING INPUT
3. NON INVERTING INPUT
4. -15V
5. OFFSET NULL
6. OUTPUT
7. +15V
8. N.C.

4. UNLESS OTHERWISE
ALL RESISTANCE VA
ALL RESISTORS ARE
ALL CAPACITANCE V

5. INPUT TO OUTPUT



-001

NEXT ASSY

TYPE NO.

A

	402	UNITS
+15VDC		
RF INPUT		
RF OUTPUT		
	5-400	MHz
	13	DB
	6	DB
	+6	DBM

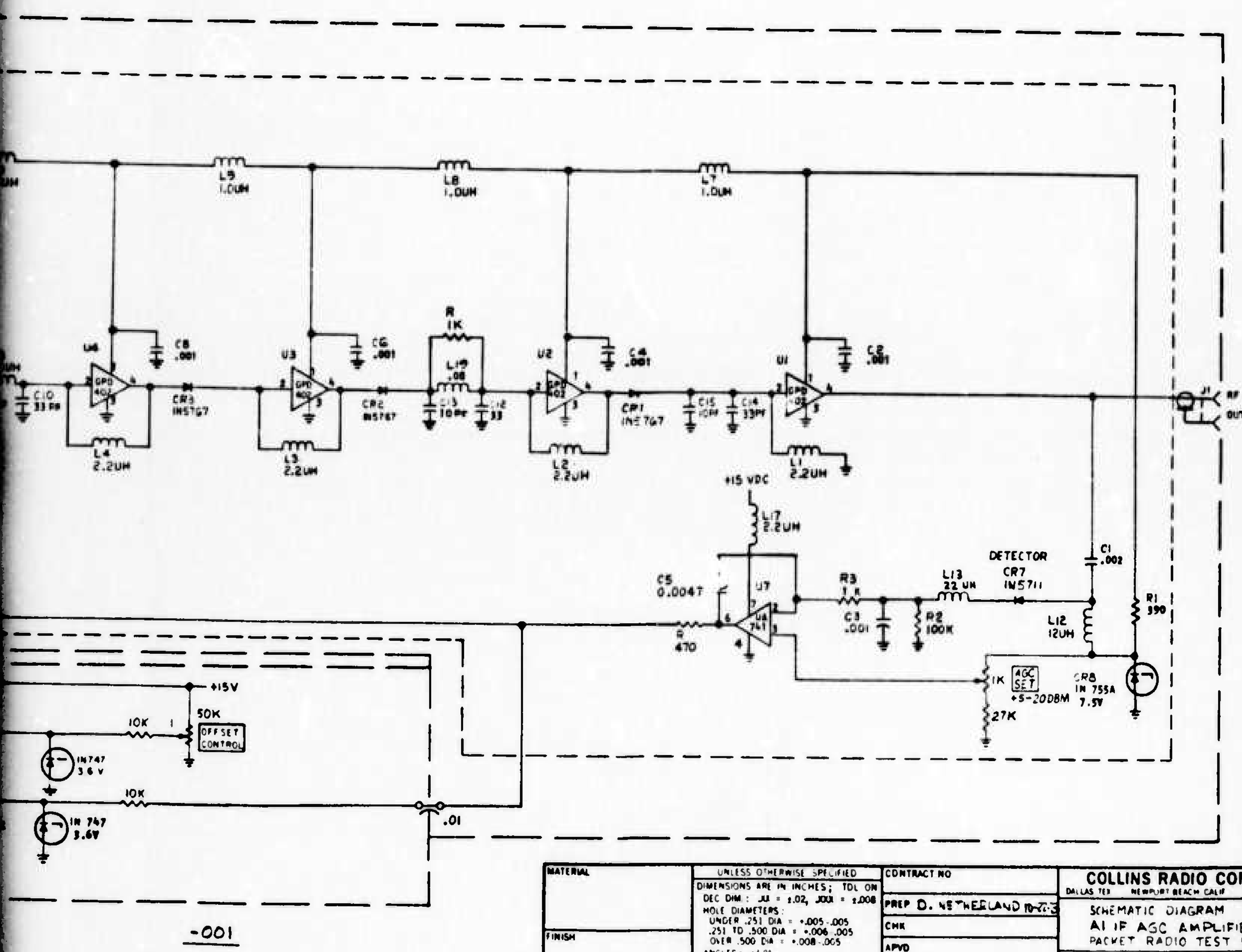
3. UA741 OP AMP BOTTOM VIEW

PIN
1. OFFSET NULL
2. INVERTING INPUT
3. NON INVERTING INPUT
4. -15V
5. OFFSET NULL
6. OUTPUT
7. +15V
8. N.C.

4. UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL RESISTORS ARE 1/4W 10%
ALL CAPACITANCE VALUES ARE IN MICROFARADS

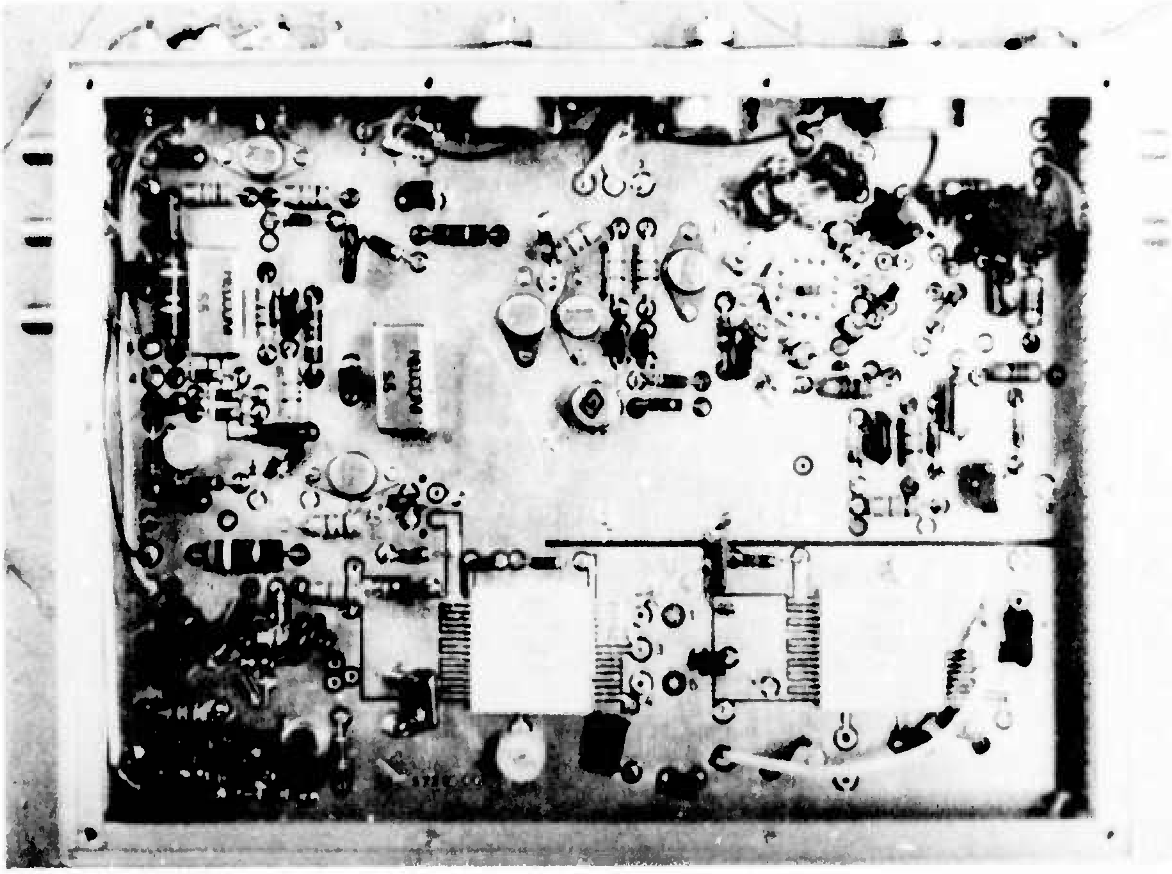
5. INPUT TO OUTPUT DELAY ≈ 20NSEC

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM: .XX = ±.02, .XXX = ±.008	PREP D. NETHERLAND 10-7-3	DALLAS TEX · NEWPORT BEACH CALIF · CEDAR RAPIDS, IA
	HOLE DIAMETERS: UNDER .251 DIA = +.005 -.005; .251 TO .500 DIA = +.006 .005; OVER .500 DIA = +.008 -.005	CHK	SCHEMATIC DIAGRAM A1 IF AGC AMPLIFIER PACKET RADIO TEST RCVR
FINISH	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9404
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE · SHEET
	PART SHALL COMPLY TO 580 5400 001		

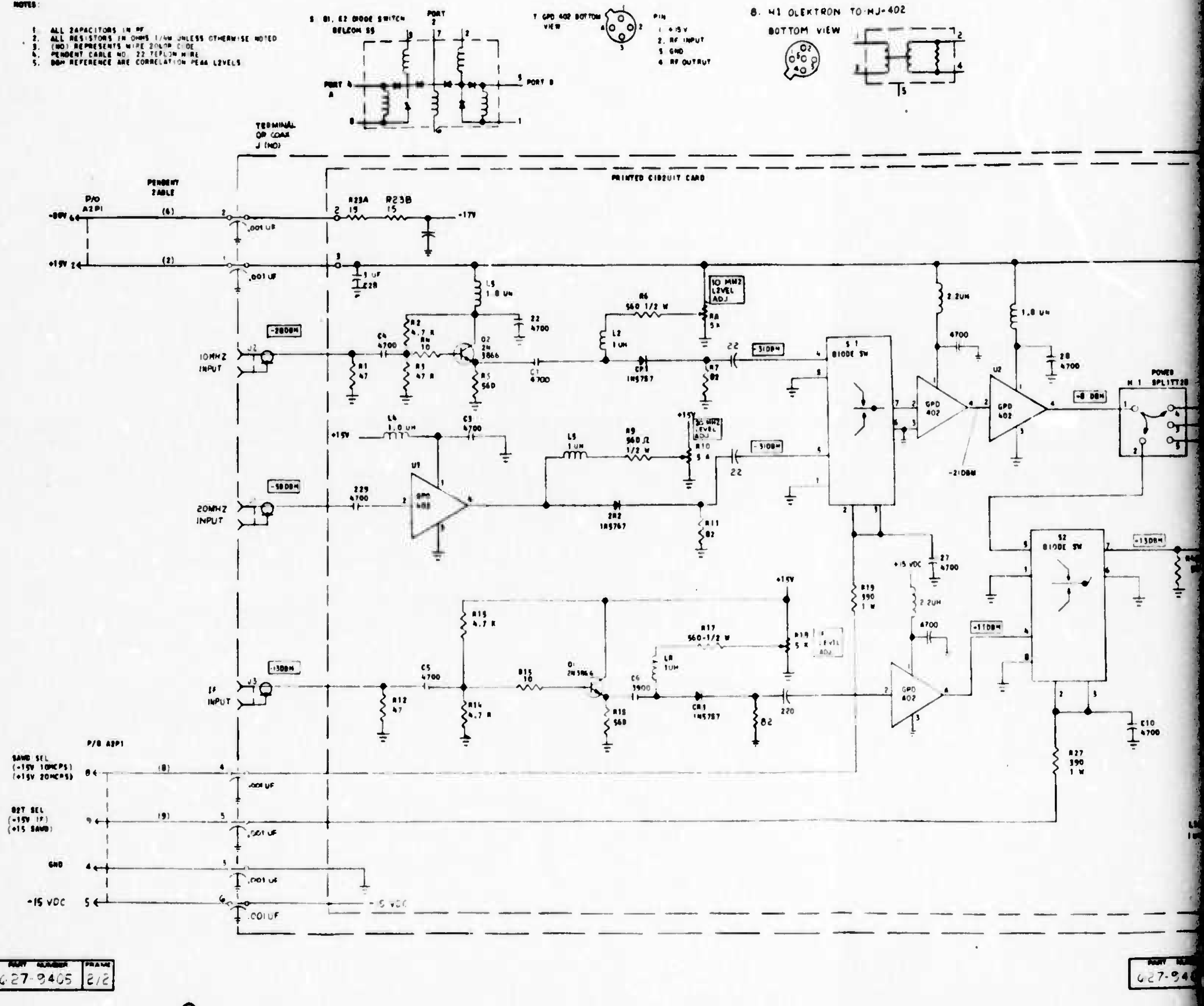
B



A2 - SAWD/IF ENV DET

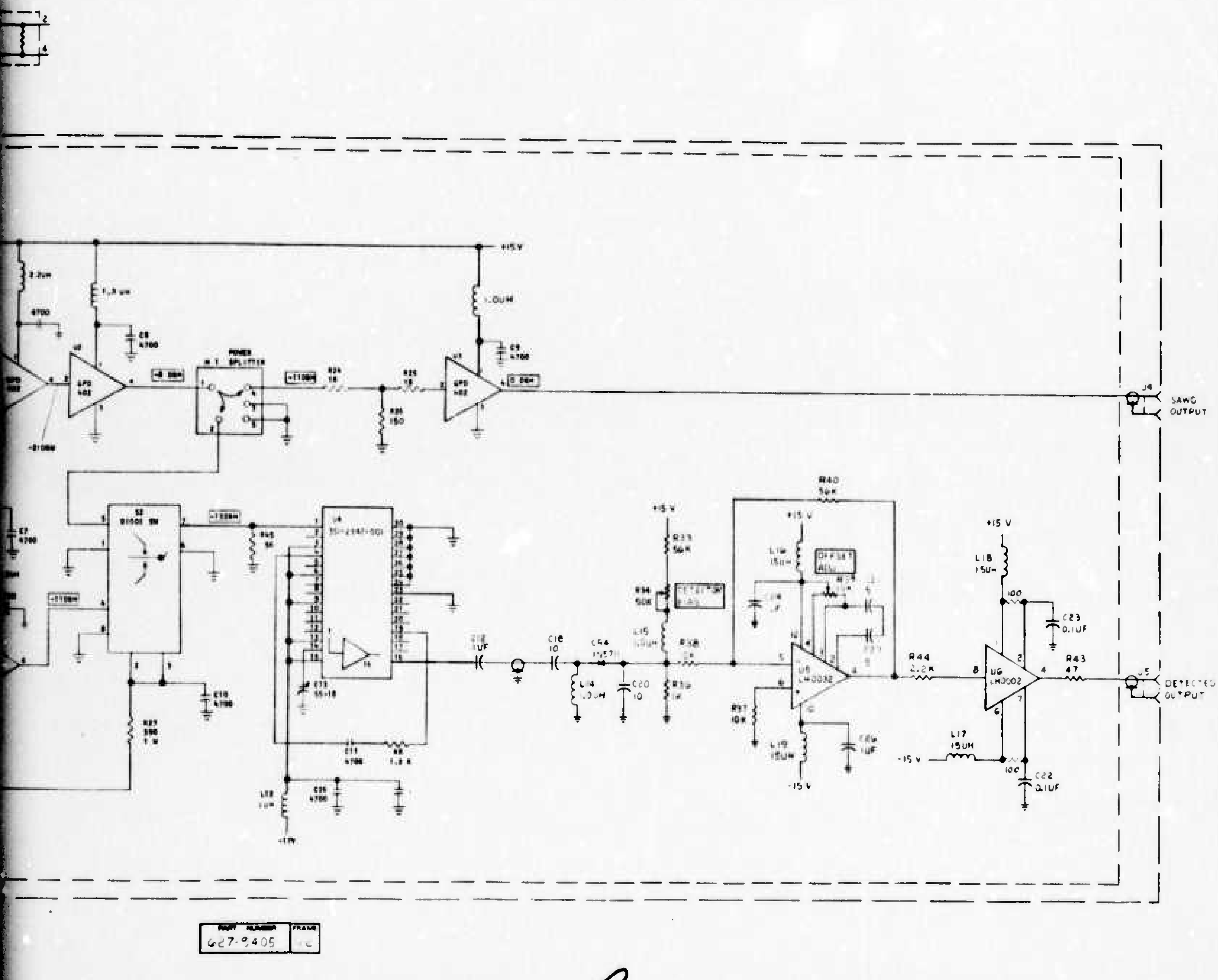
NOTES:

1. ALL CAPACITORS IN PF
2. ALL RESISTORS IN OHMS 1/4W UNLESS OTHERWISE NOTED
3. (NO) REPRESENTS WIRE COLOR CODE
4. PENDENT CABLE NO. 22 TEFLON WIRE
5. DBM REFERENCE ARE CORRELATION PEAK LEVELS



PART NUMBER	FRAME
627-9405	2/2

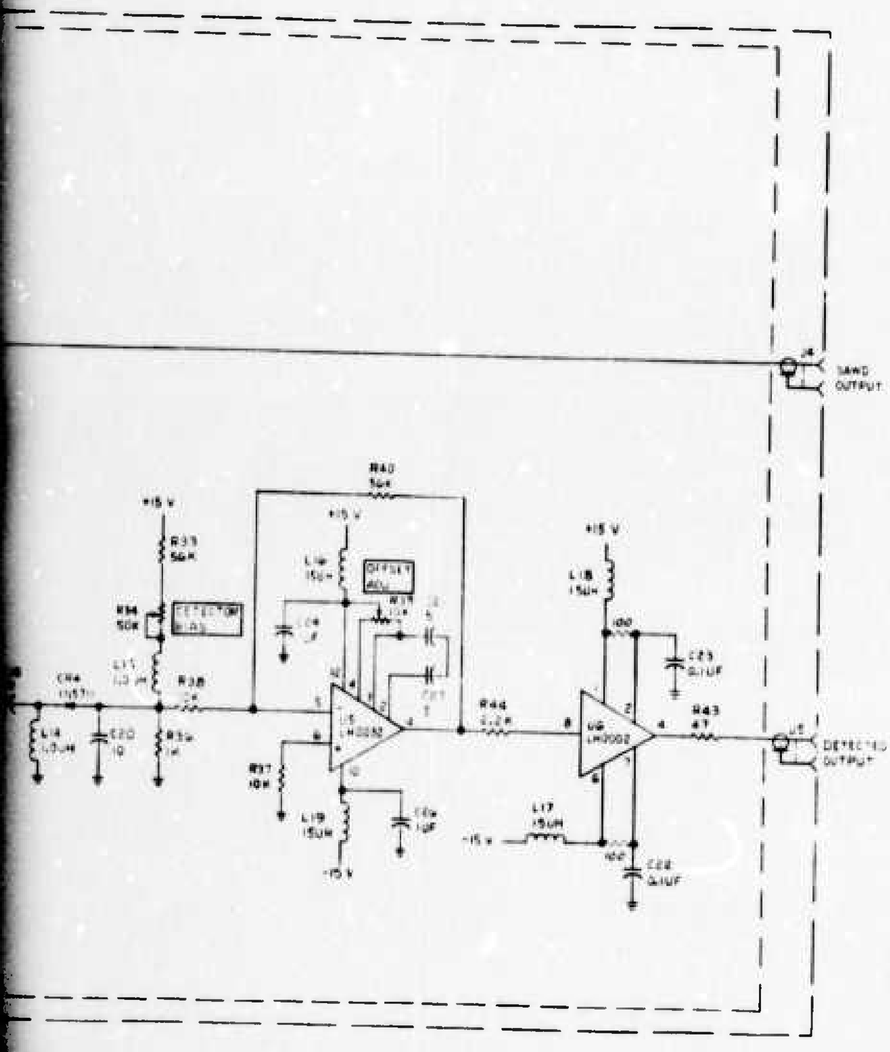
A


+15 V
2.2UH
4700
C8 4700
POWER SPLITTER
R24 18
R25 18
R26 150
C9 4700
1.0UH
J4
SAWG OUTPUT
R40 56K
R37 56K
R34 50K
DETECTOR BIAS
OFFSET ADJ
L16 15UH
U5 LH0032
C12 1UF
C18 10
C20 10
L14 10UH
R38 1K
R37 10K
L19 15UH
C26 1UF
R44 2.2K
U6 LH0002
R43 47
J5
DETECTED OUTPUT
L18 15UH
C23 0.1UF
C22 0.1UF
L17 15UH
-15 V
C19 4700
R27 390
C21 4700
C25 4700

627-9405

B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

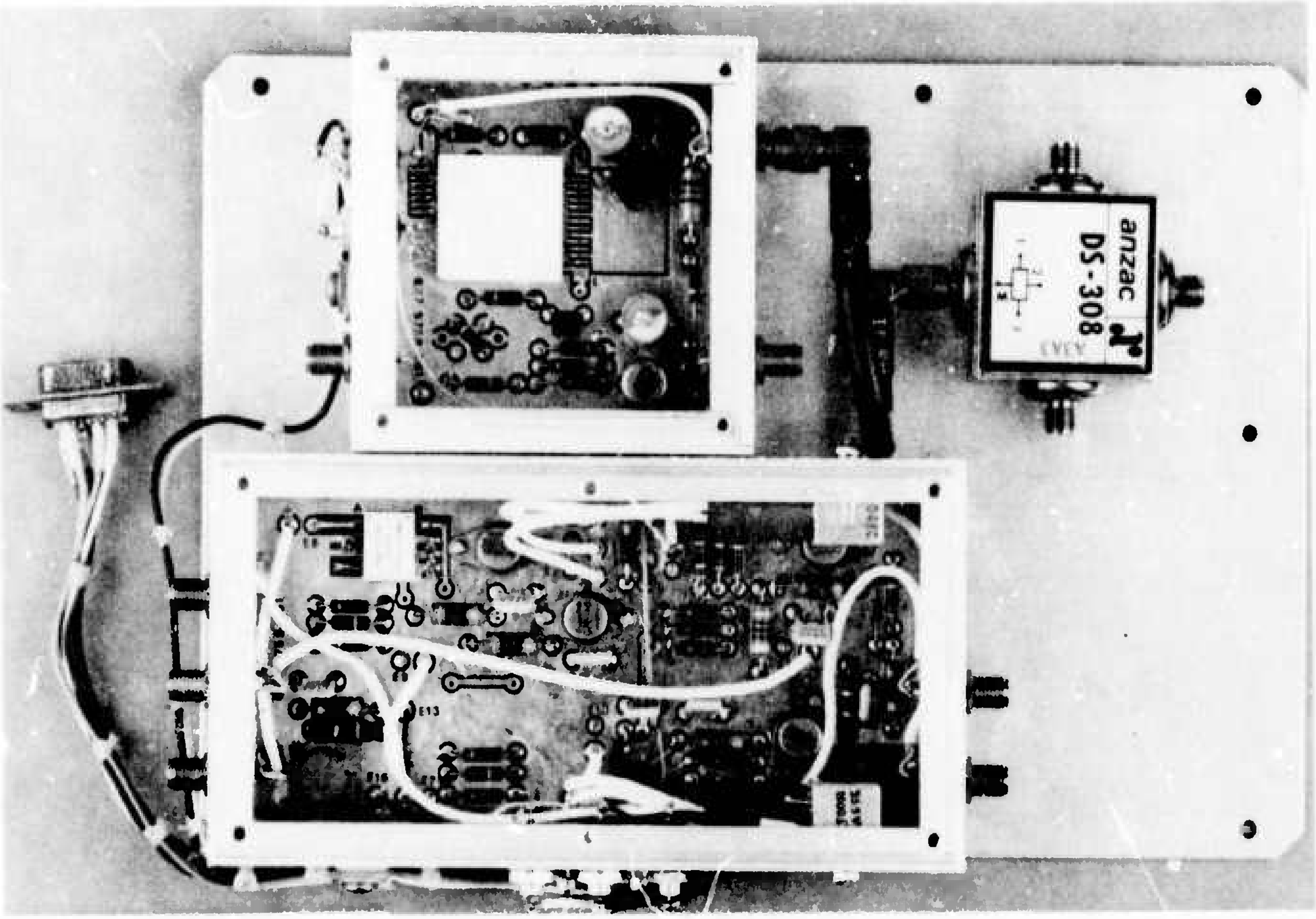


-001

CONTRACT NO.	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA		
PREP'D NETHERLAND 73	WIRING DIAGRAM A2 SANDWICH ENVELOP DET ARPA TEST RCVR		
CHK			
APVD			
	SIZE	CODE IDENT 13499	DWG NO. 627-3405
	SCALE		SHEET

B

C



A3( )

NOTES:

1. NARROWBAND INPUT 20DB BELOW WIDEBAND INPUT
   NB FILTER LOSS 9DB

   $10 \text{ LOG} \frac{40 \text{ MHz BW}}{.9 \text{ MHz BW}} = 19\text{DB}$

2. BOTTOM VIEW OF K1 AND K2

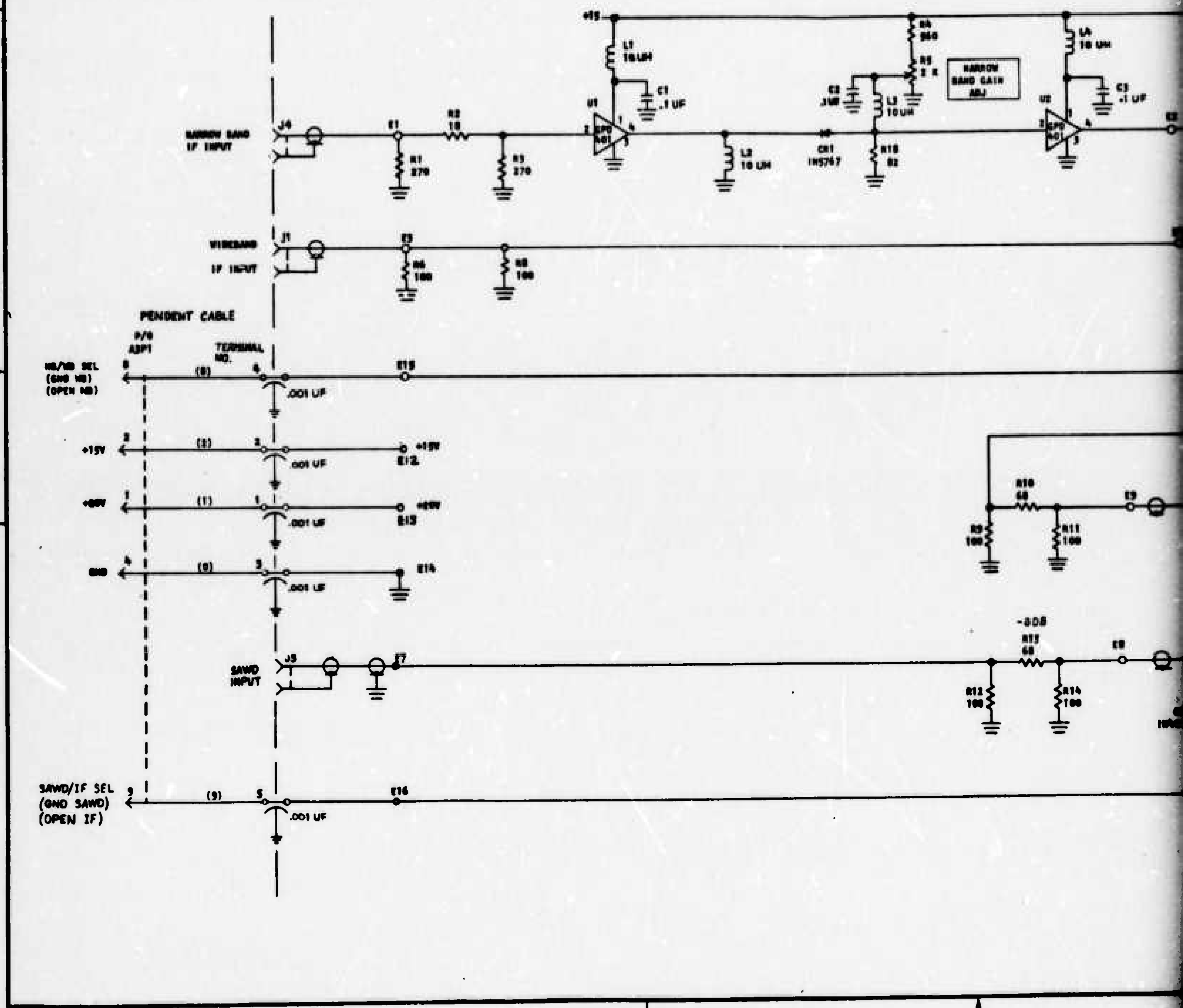
   A B NO NC C

3. PENDENT CABLE NO. 22 TEFLON WIRE () INDICATES COLOR CODE
4. P1 IS A COMMON POWER/SIGNAL PLUG FOR A3 A1 AND A3 A2.
5. GPD 402 BOTTOM VIEW

   PIN
   1 +15V DC
   2 RF INPUT
   3 GND
   4 RF OUTPUT

6. POWER SPLITTER LORCH PS 260 TOP VIEW

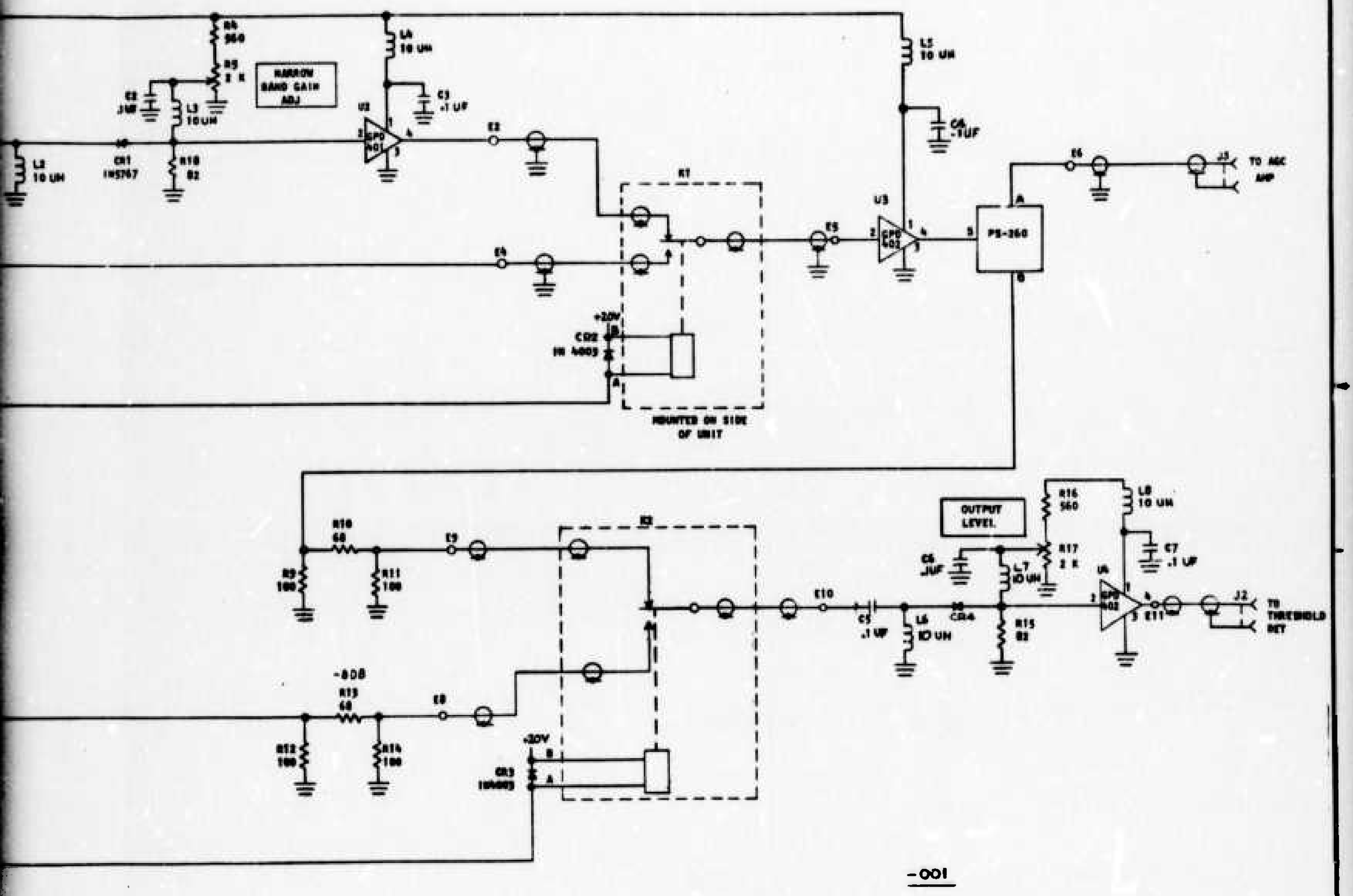
   INPUT
   OUTPUT B A OUTPUT
   UNMARKED PINS ARE GND



NEXT ASSY: TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



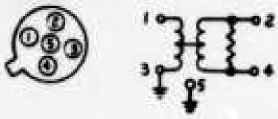
-001

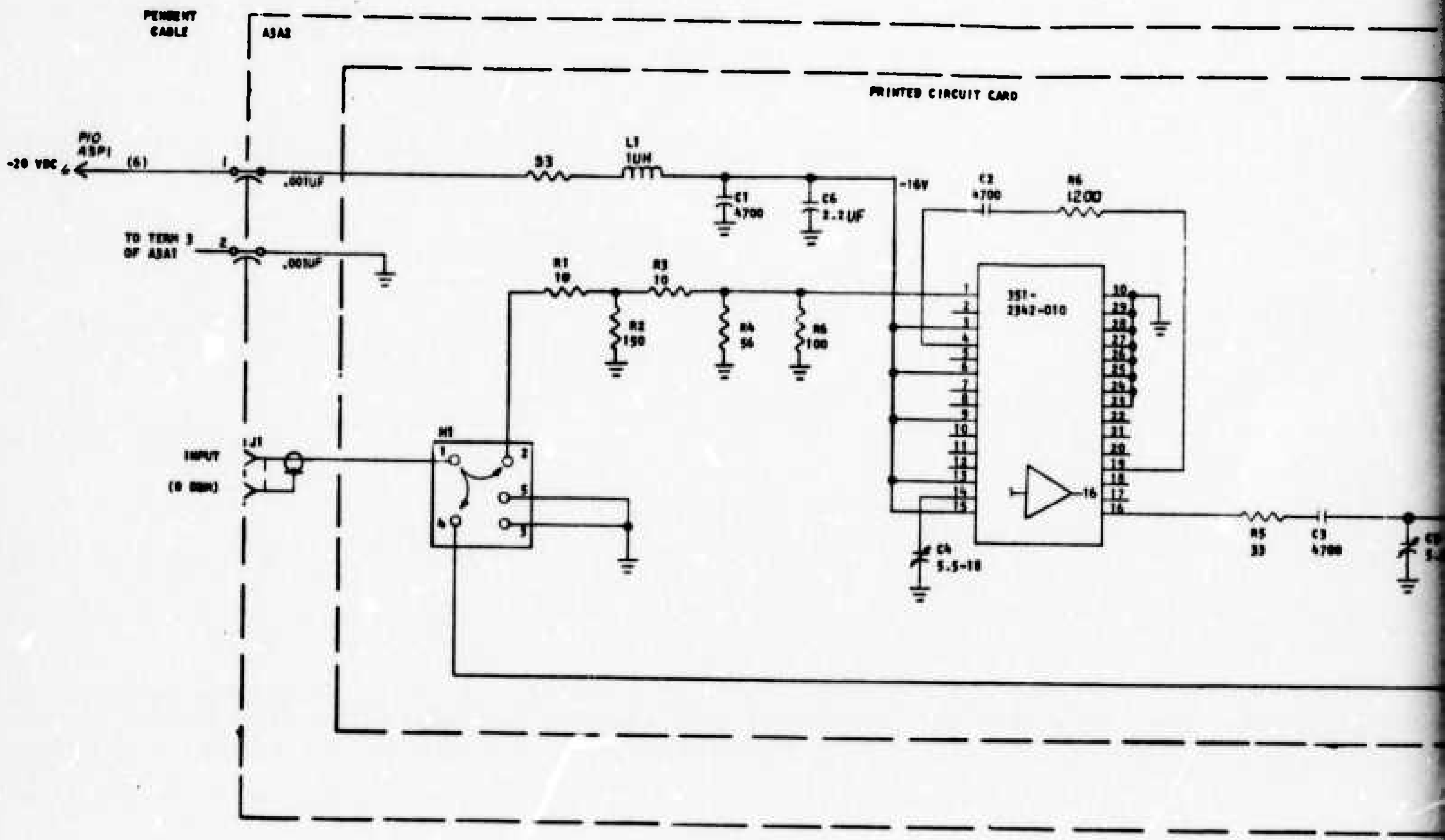
MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP D. NETHERLAND 10-12-73	DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
	HOLE DIAMETERS: UNDER .251 DIA = +.005 -.005; .251 TO .500 DIA = +.006 -.005; OVER .500 DIA = +.008 -.005	CHK	SCHEMATIC DIAGRAM A3A1 IF SWITCH PACKET RADIO TEST RCVR
FINISH	ANGLES: ±1.0°	APVD	SIZE D — CODE IDENT 13499 — DWG NO 627-9406
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE NONE — SHEET
	PART SHALL COMPLY TO 580-5400-001		

B

NOTES:

1. A3A2/A3A3 MOUNTED WITH A3A1
2. PENDENT CABLE IS 22 TEFLON WIRE OF COLOR CODE NOTED IN ()
3. UNLESS OTHERWISE SPECIFIED
   ALL RESISTANCE VALUES ARE IN OHMS (1/4W, 10%)
   ALL CAPACITANCE VALUES ARE IN PICOFARADS
4. H1 OLEKTRON TO-HJ-402-VS DIVIDER
   BOTTOM VIEW



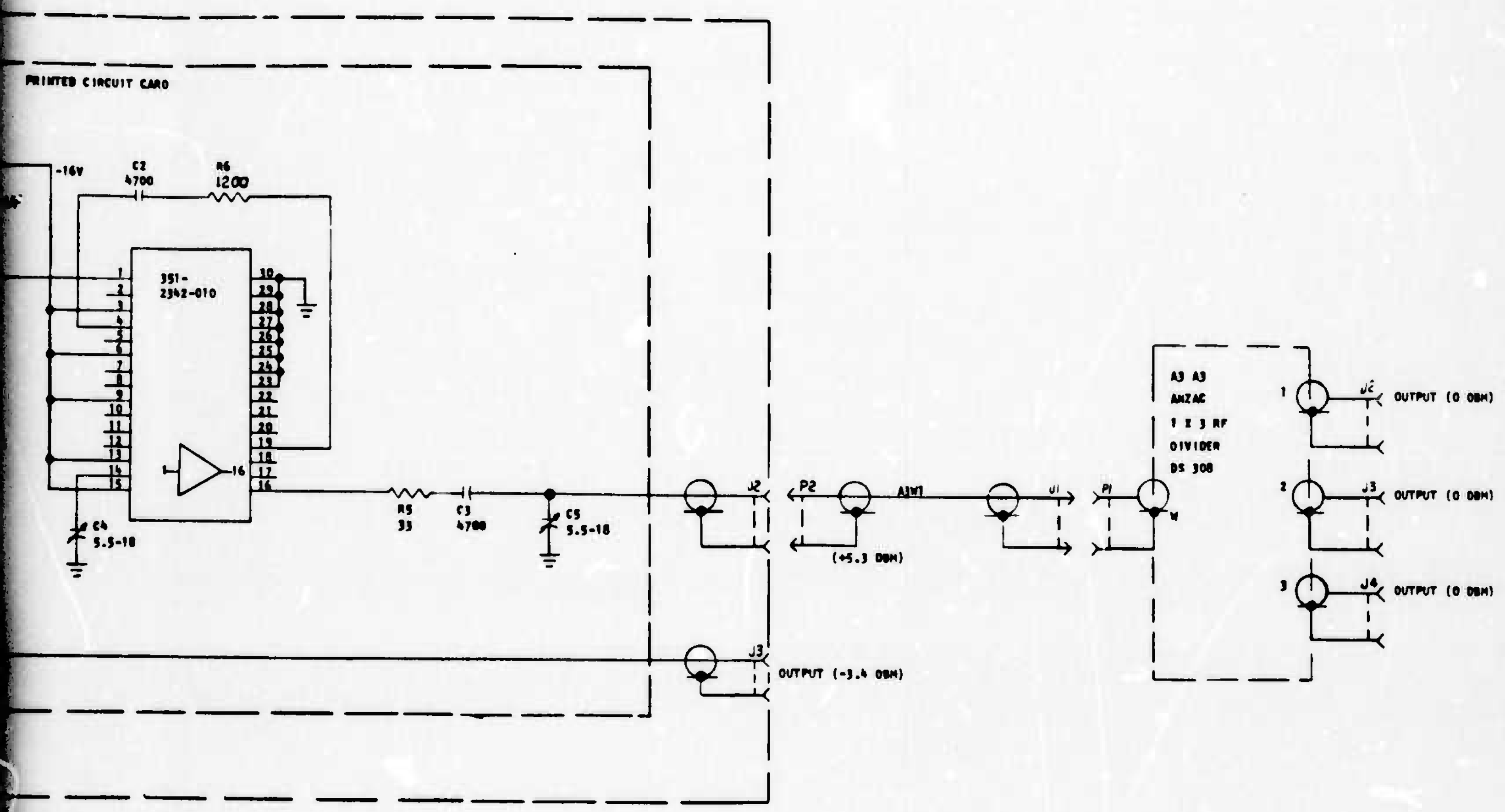


NEXT ASSY:

TYPE NO:

A

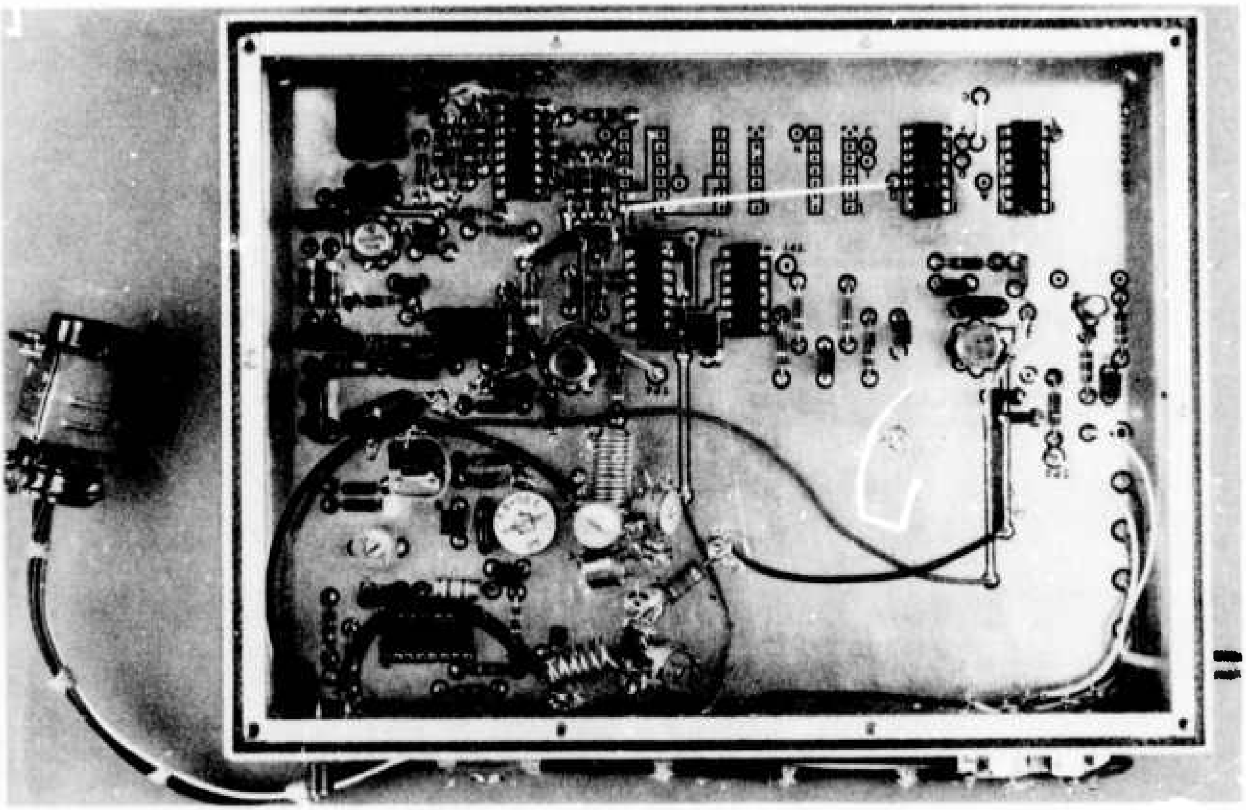
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



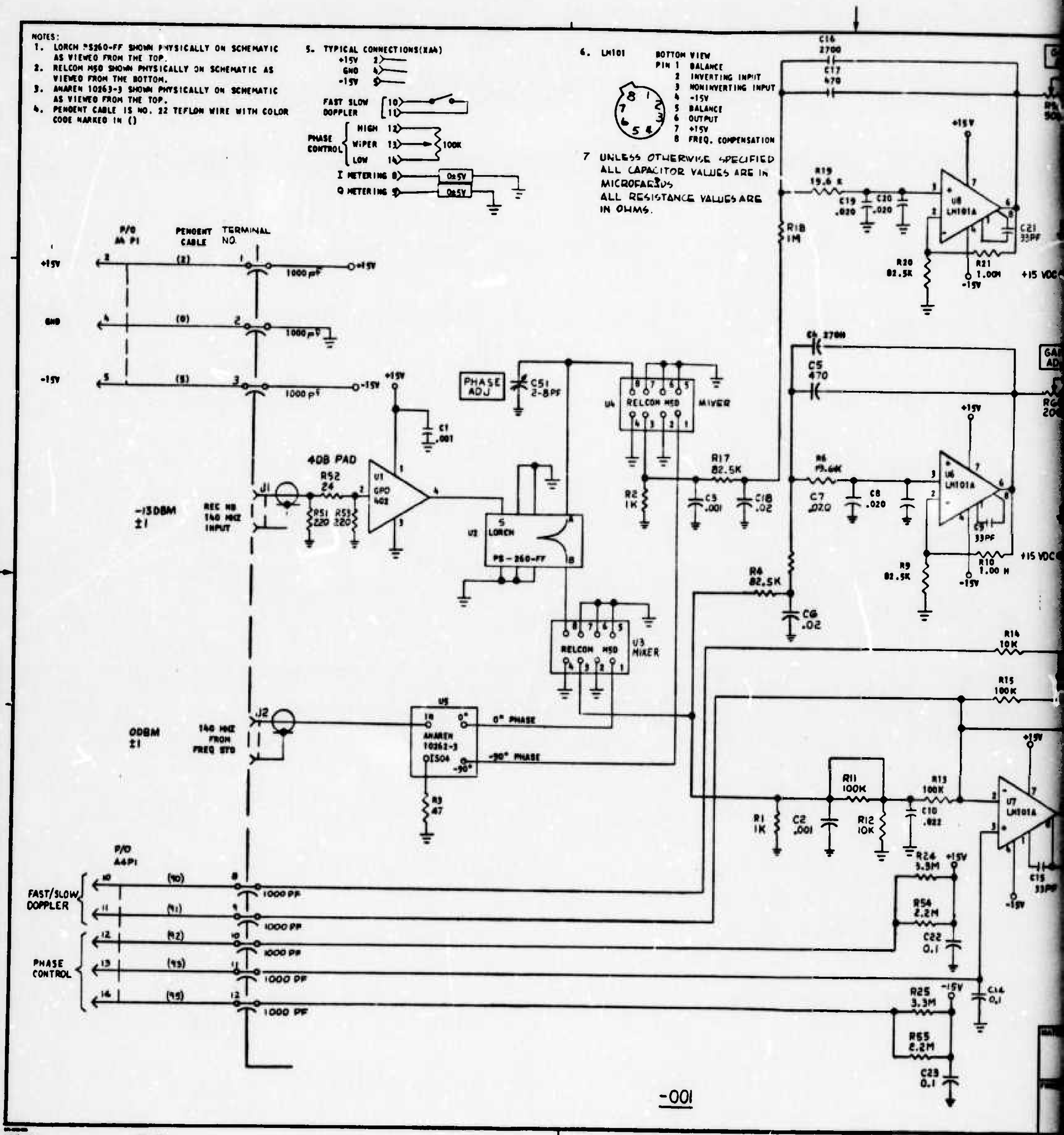
-001

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP Diana Catherland 10-22-75	DALLAS TEX · NEWPORT BEACH CALIF · CEDAR RAPIDS IA
FINISH	HOLE DIAMETERS: UNDER .251 DIA = +.005-.005; .251 TO .500 DIA = +.006-.005; OVER .500 DIA = +.008-.005	CHK	SCHEMATIC DIAGRAM A3A2/A3A3 1 X 4 RF DIVIDER PACKET RADIO TEST RCVR
	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 527-9407
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		
	PART SHALL COMPLY TO 580 5400 001		SCALE NONE · SHEET

B



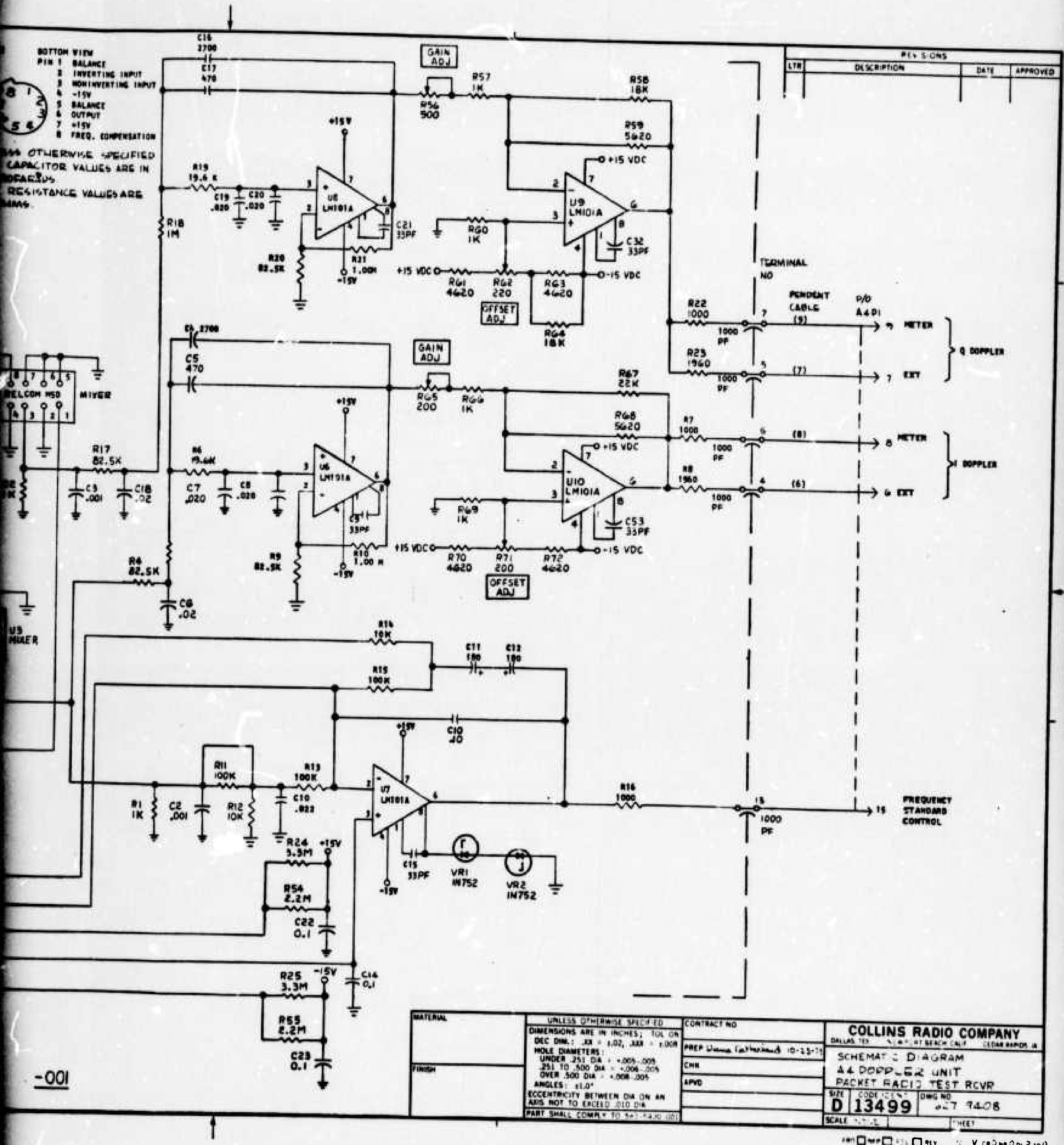
A4 - DOPPLER



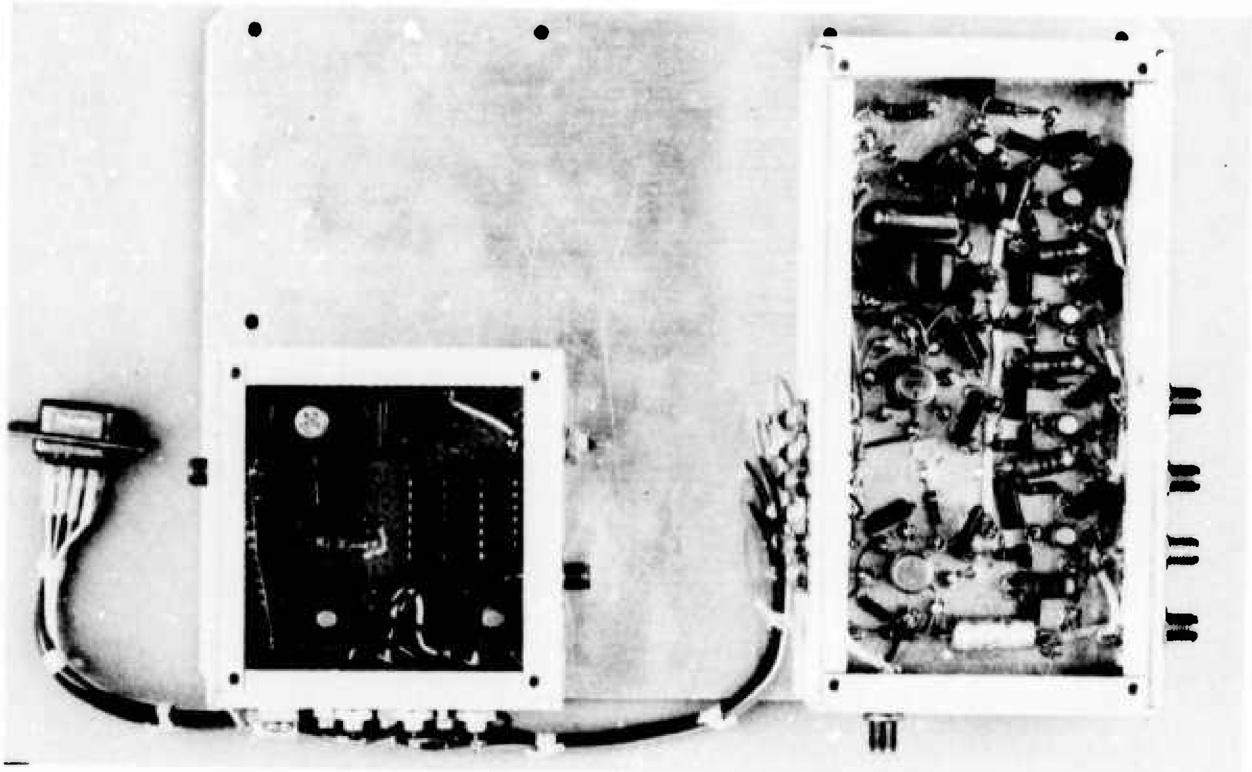
NEXT ASSY:

TYPE NO:

A


BOTTOM VIEW
PIN 1 BALANCE
2 INVERTING INPUT
3 NONINVERTING INPUT
4 -15V
5 BALANCE
6 OUTPUT
7 +15V
8 FREQ. COMPENSATION
OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN
RESISTANCE VALUES ARE
GAIN ADJ
OFFSET ADJ
U8 LM101A
U9 LM101A
U6 LM101A
U10 LM101A
U7 LM101A
+15 VDC
-15 VDC
TERMINAL NO
PENDENT CABLE
P/O A4P1
METER
EXT
Q DOPPLER
I DOPPLER
FREQUENCY STANDARD CONTROL
RELCOM MSD
MIXER
U3 MIXER
VR1 1N752
VR2 1N752
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES; TOL ON
DEC DIM.: .XX = ±.02, .XXX = ±.008
HOLE DIAMETERS:
UNDER .251 DIA = +.005-.005
.251 TO .500 DIA = +.006-.005
OVER .500 DIA = +.008-.005
ANGLES: ±1.0°
ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA
CONTRACT NO
PREP
CHK
APVD
COLLINS RADIO COMPANY
DALLAS, TEX.
NEWPORT BEACH CALIF.
CEDAR RAPIDS IA.
SCHEMATIC DIAGRAM
A4 DOPPLER UNIT
PACKET RADIO TEST RCVR
SIZE D
CODE IDENT 13499
DWG NO
SCALE
SHEET
-001

B



A5( )

NOTES:

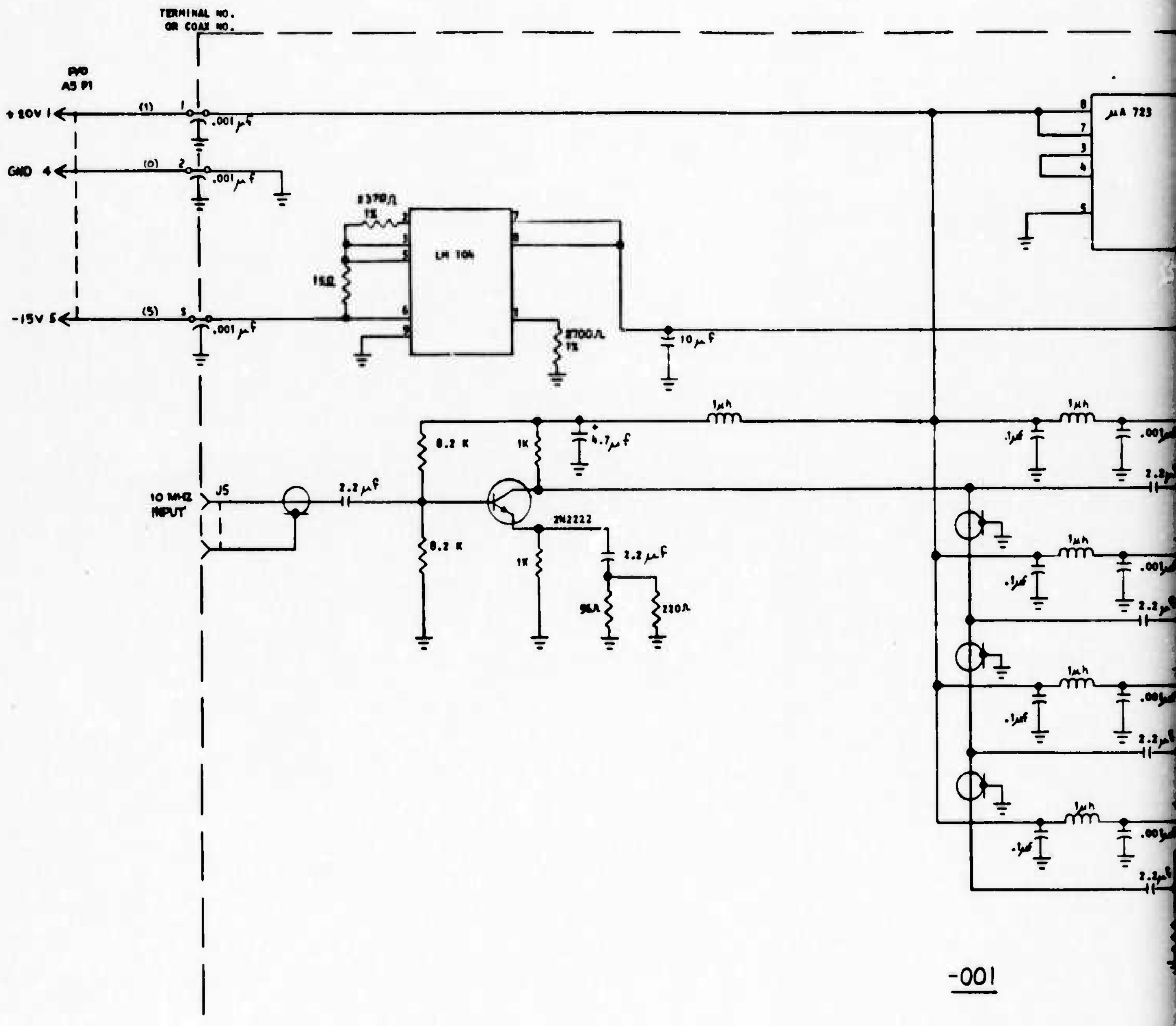
1. LM 104 (BOTTOM VIEW)

PIN 1. ADJUST
2. REFERENCE
3. REF SUPPLY
4. COMPENSATION
5. UNREGULATED INPUT (CONNECTED TO CASE)
6. CURRENT LIMIT
7. BOOSTER
8. REGULATED OUTPUT
9. GROUND
10. NC CONNECTION

2. UA 723 (BOTTOM VIEW)

PIN 1. CURR2NT SENSE
2. INVERTING INPUT
3. NON INVERTING INPUT
4. V N2F
5. -V (CONNECTED TO CASE)
6. V OUT
7. V OUTPUT COLLECTOR
8. V+
9. FREQUENCY COMPENSATION
10. CURR2NT LIMIT

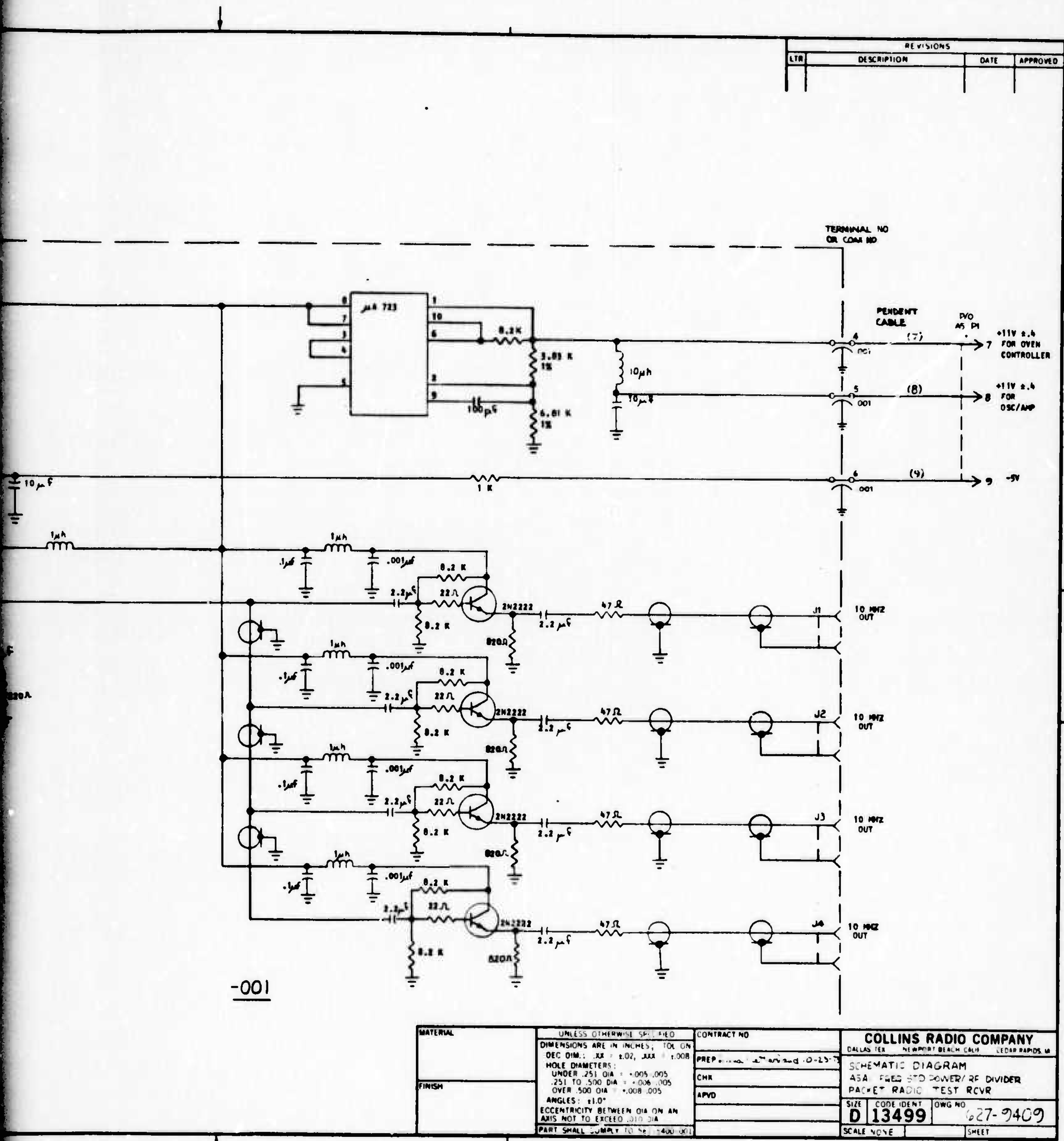
3. PENDENT CABL2 IS NO. 22 T2FLON WIRE OF COLOR CODE NOT2D IN ()



-001

NEXT ASSY:
TYPE NO:

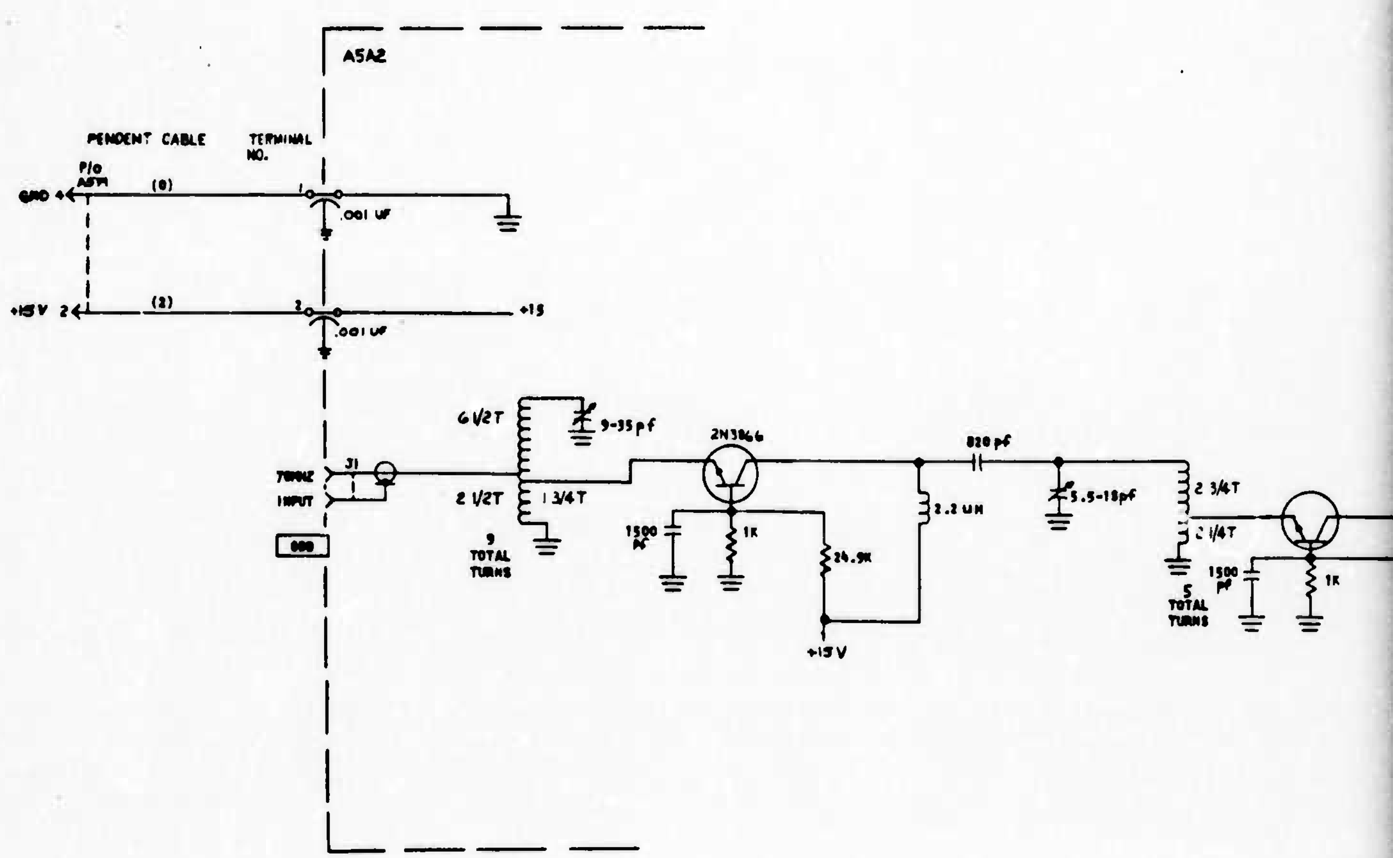
A


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
TERMINAL NO OR COAX NO
μA 723
8.2 K
3.83 K 1%
6.81 K 1%
100 pf
10 μh
10 μf
PENDENT CABLE
PVO A5 P1
.001
(7)
(8)
(9)
+11V ±.4 FOR OVEN CONTROLLER
+11V ±.4 FOR OSC/AMP
-5V
1 K
1 μh
.1 μf
.001 μf
2.2 μf
22 Ω
2N2222
47 Ω
820 Ω
J1
J2
J3
J4
10 MHZ OUT
-001
MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX ± .02, .XXX ± .008
HOLE DIAMETERS:
UNDER .251 DIA + .005 .005
.251 TO .500 DIA + .006 .005
OVER .500 DIA + .008 .005
ANGLES: ±1.0°
ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA
PART SHALL COMPLY TO
CONTRACT NO
PREP
CHK
APVD
COLLINS RADIO COMPANY
DALLAS TEX
NEWPORT BEACH CALIF
CEDAR RAPIDS IA
SCHEMATIC DIAGRAM
A5A FREQ STD POWER/ RF DIVIDER
PACKET RADIO TEST RCVR
SIZE D
CODE IDENT 13499
DWG NO 627-9409
SCALE NONE
SHEET

B

NOTES:

1. ALL COILS ON 1/4" DIAMETER NO 20 BUSS WIRE
2. PENDENT CABLE 12 NO 22 TEFLON WIRE OF COLOR CODE NOTED IN ()



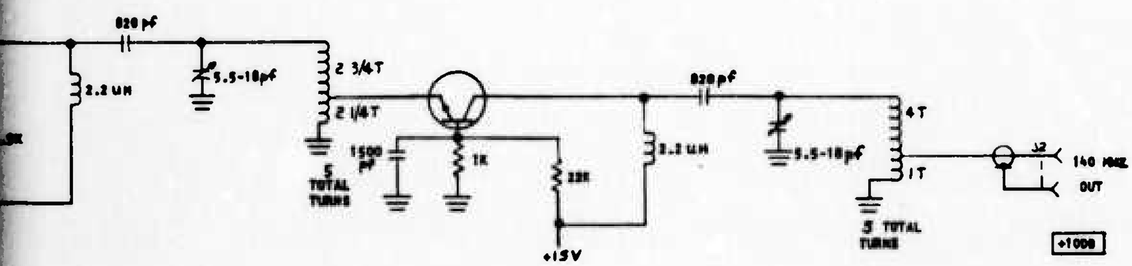
001

NEXT ASSY:

TYPE NO:

A

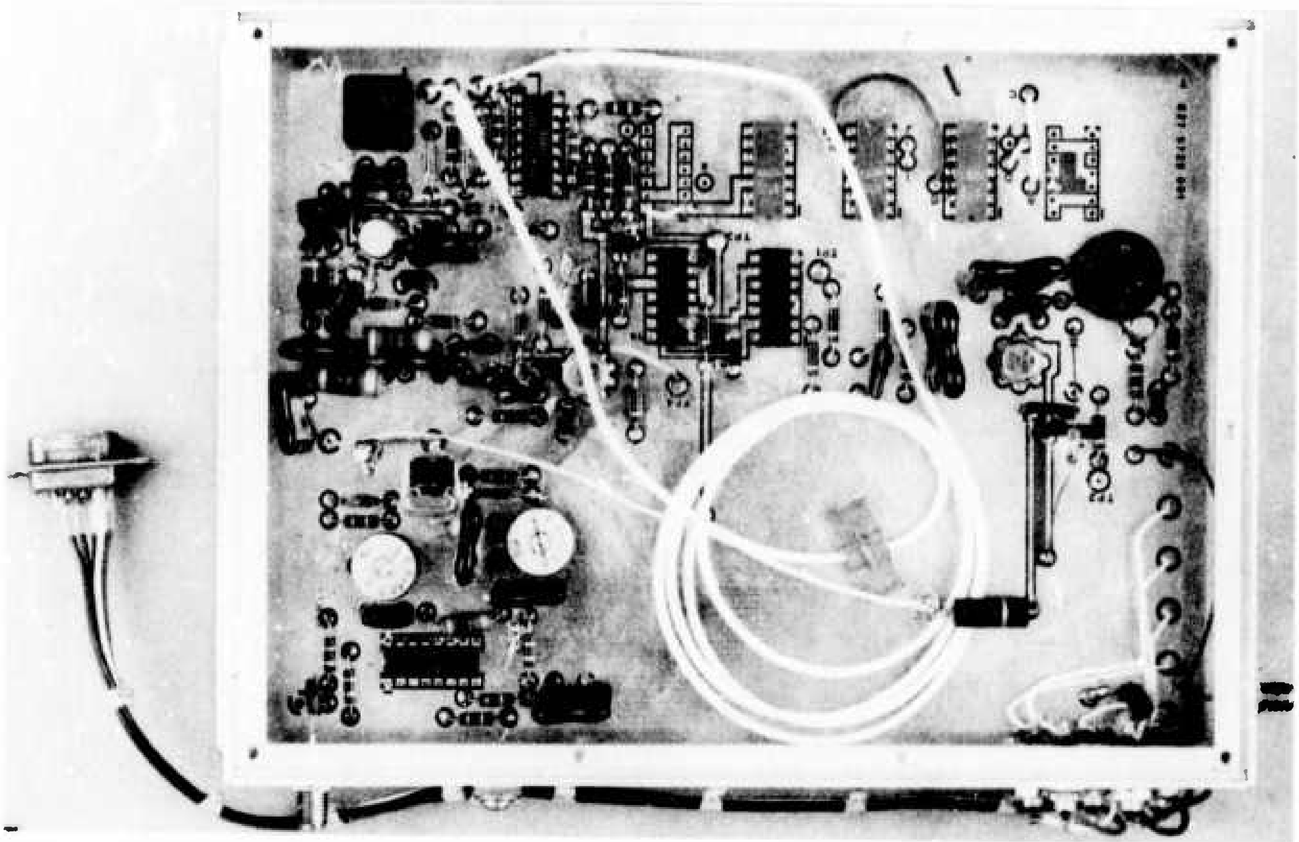
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



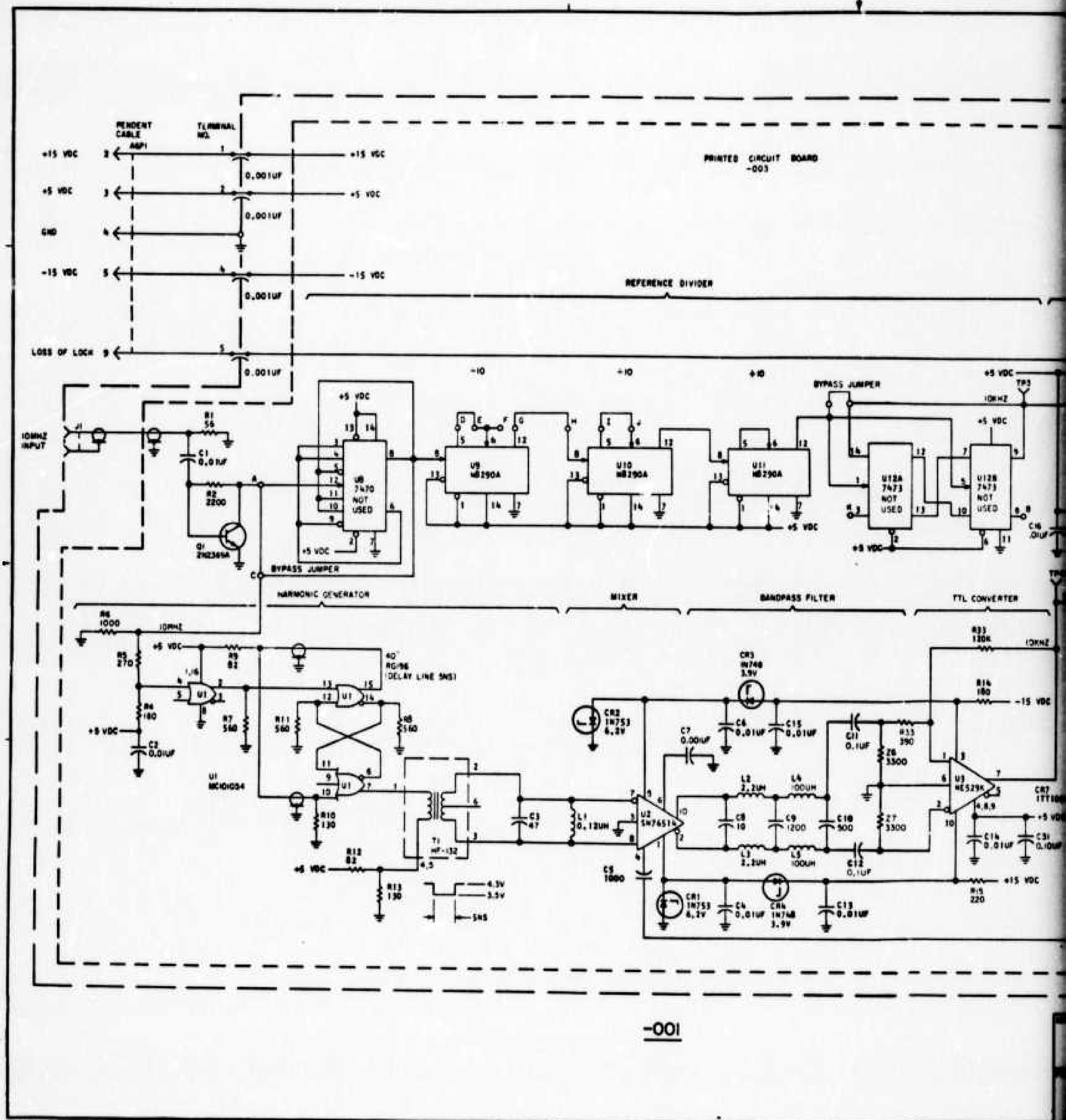
001

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP DIANA NETHERLAND 1 NOV 1973	DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS, IA
FINISH	HOLE DIAMETERS: UNDER .251 DIA = +.005 .005; .251 TO .500 DIA = +.006 .005; OVER .500 DIA = +.008 .005	CHK	SCHEMATIC DIAGRAM A5 A2 MULTIPLIER X2 PACKET RADIO TEST RCVR
	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9410
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		
	PART SHALL COMPLY TO STD 1400-001		SCALE NONE · SHEET

B



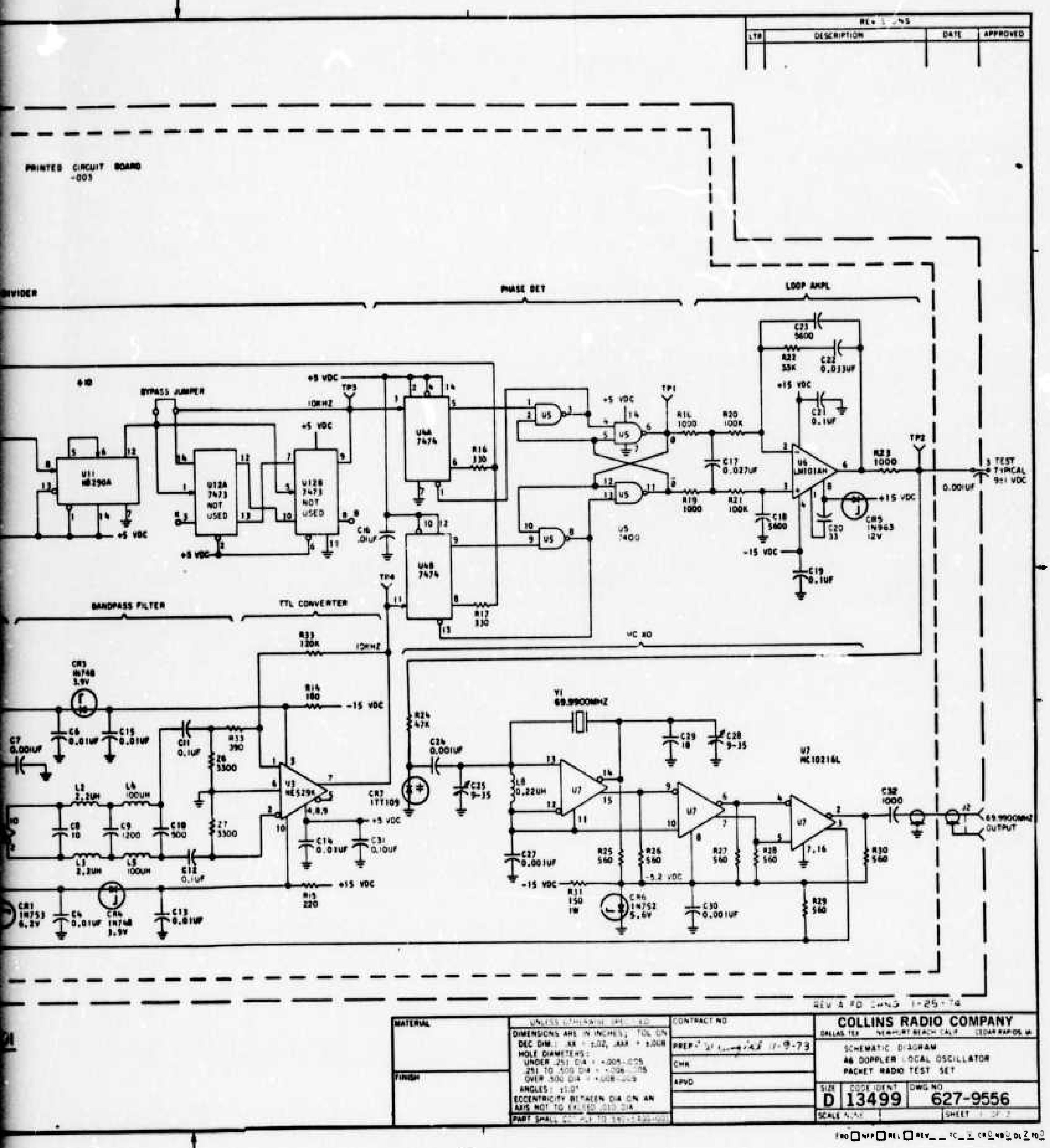
A6 - DOPPLER LO



NEXT ASSY:

TYPE NO:

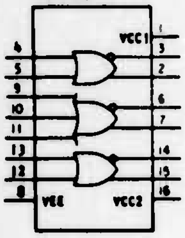
A


PRINTED CIRCUIT BOARD
-003
DIVIDER
PHASE DET
LOOP AMPL
÷10
BYPASS JUMPER
10KHZ
+5 VDC
U11 MB290A
U12A 7473 NOT USED
U12B 7473 NOT USED
U4A 7474
U4B 7474
U5 7400
U6 LM101AH
R16 330
R17 330
R14 1000
R19 1000
R20 100K
R21 100K
R22 33K
R23 1000
C17 0.027UF
C18 5600
C19 0.1UF
C20 33
C21 0.1UF
C22 0.033UF
C23 5600
CR5 1N963 12V
+15 VDC
-15 VDC
TEST TYPICAL 9±1 VDC
0.001UF
BANDPASS FILTER
TTL CONVERTER
VC XO
R33 120K
R14 180
R33 390
R26 3300
R27 3300
U3 NE529K
CR3 1N748 3.9V
CR7 1TT109
R24 47K
C24 0.001UF
C25 9-35
Y1 69.9900MHZ
C29 18
C28 9-35
U7 MC10216L
L8 0.22UH
C27 0.001UF
R25 560
R26 560
R27 560
R28 560
R29 560
R30 560
-5.2 VDC
R31 150 1W
CR6 1N752 5.6V
C30 0.001UF
C32 1000
69.9900MHZ OUTPUT
L2 2.2UH
L3 2.2UH
L4 100UH
L5 100UH
C8 10
C9 1200
C10 500
C11 0.1UF
C12 0.1UF
C13 0.01UF
C14 0.01UF
C31 0.1UF
C4 0.01UF
C6 0.01UF
C7 0.001UF
C15 0.01UF
CR1 1N753 6.2V
CR4 1N748 3.9V
R15 220
REV A PD CHNG 1-25-74
COLLINS RADIO COMPANY
SCHEMATIC DIAGRAM
A6 DOPPLER LOCAL OSCILLATOR
PACKET RADIO TEST SET
D 13499 627-9556

B

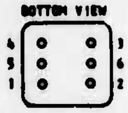
NOTES:

1. U1 MC10105L (MECL)



2. T1 2-MATCH HF 132

BOTTOM VIEW



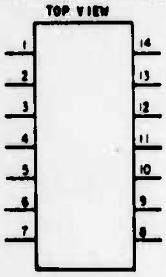
3. U2 SN76514

TOP VIEW

1 +VCC
2 OUTPUT
3 FLOATING GND
4 LOCAL OSC INPUT
5 -VCC
6 DECOUPLE 1
7 DECOUPLE 2
8 RF INPUT
9 B C
10 OUTPUT

4. U9 THRU U11 MC290A

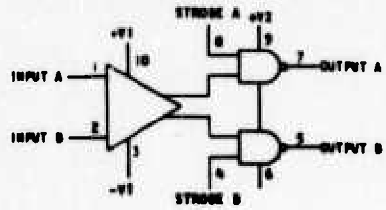
TOP VIEW



1 DATA STROBE
2 C OUT
3 DATA C
4 DATA A
5 A OUT
6 CLOCK 2
7 GND
8 CLOCK 1
9 B OUT
10 DATA B
11 DATA D
12 D OUT
13 DATA RESET
14 VCC

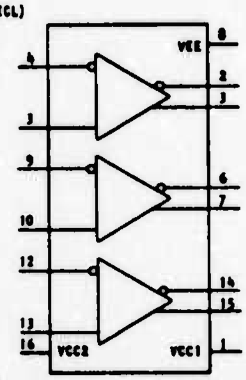
5. U3 NE529K

TOP VIEW

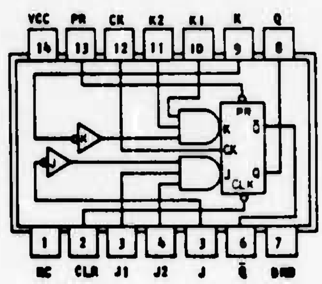


6. U7 MC10216L

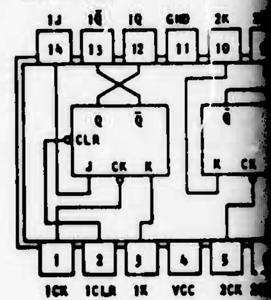
TRIPPLE DIFF AMP (MECL)



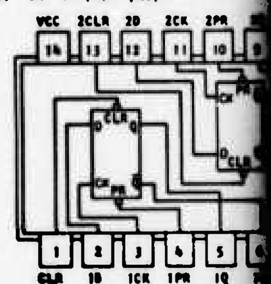
7. U6 TI 7470



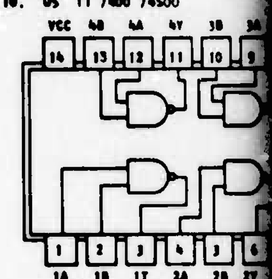
8. U12 TI 7473



9. U4 TI 7474 74S74



10. U5 TI 7400 74S00

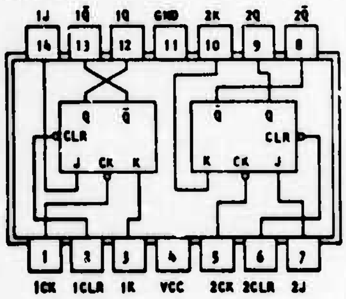


NEXT ASSY: TYPE NO:

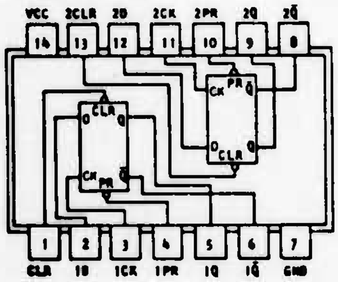
A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

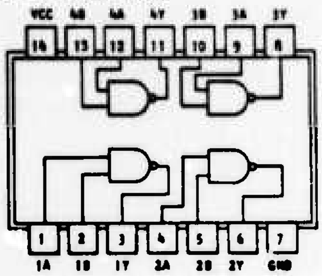
8. U12 TI 7473



9. U4 TI 7474 74S74



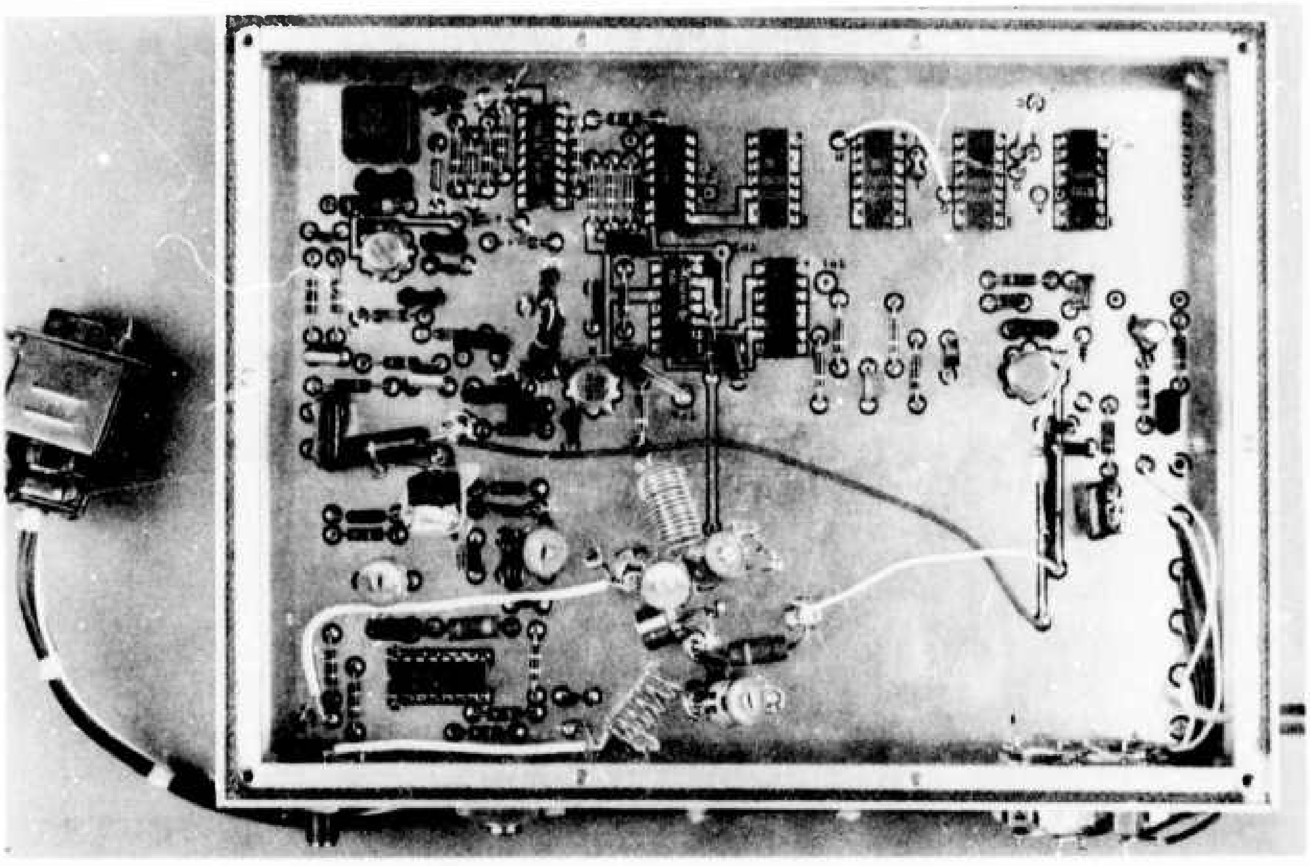
10. U5 TI 7400 74S00



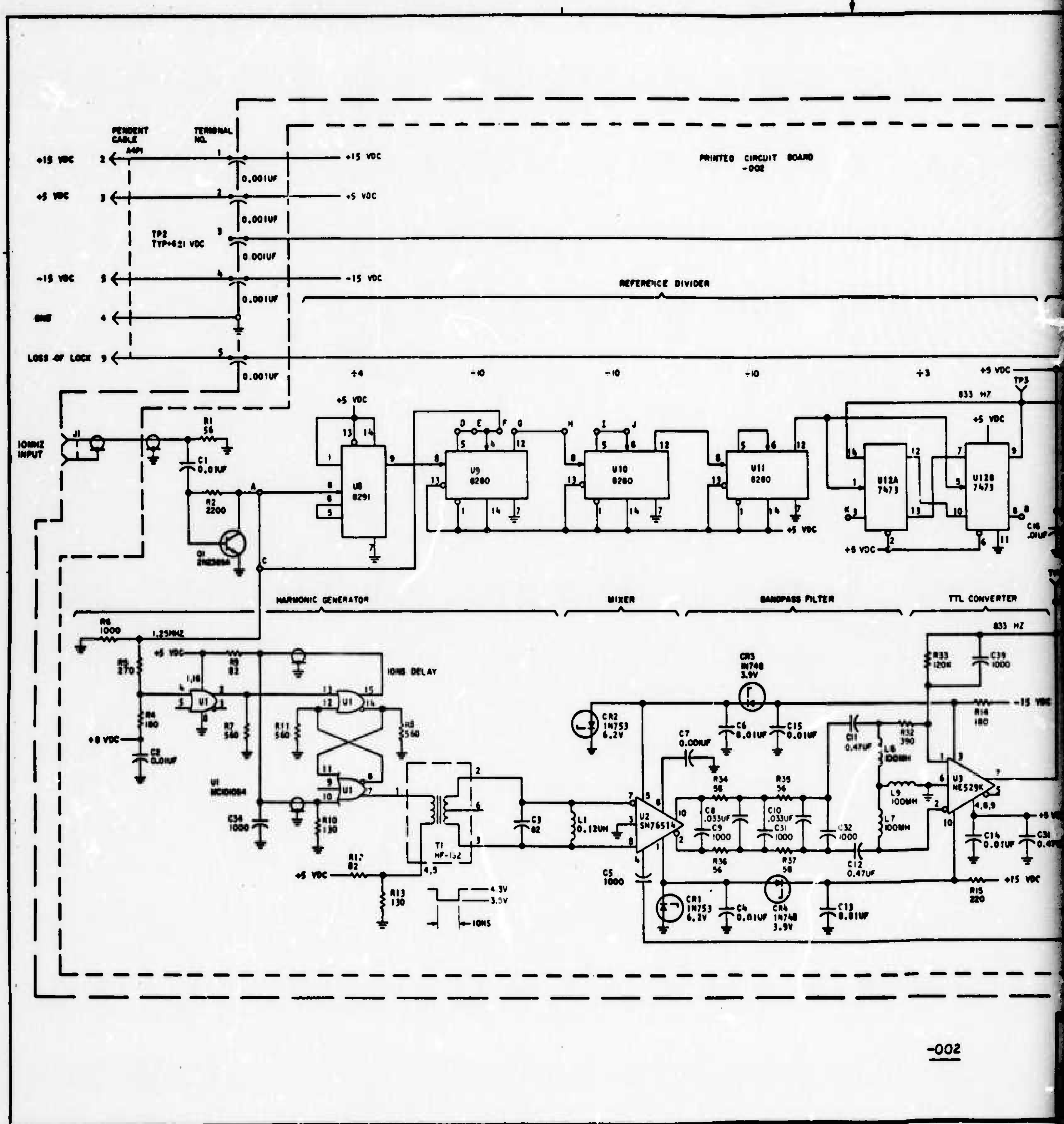
11. UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS
ALL RESISTORS ARE 1/4 W CARBON
ALL CAPACITANCE VALUES ARE IN PICOFARADS.

SIZE	CODE IDENT	DWG NO
D	13499	627-9556
SCALE NONE	REV	SHEET 2 OF 2

B



A7 - 1370 MHZ RCV LO

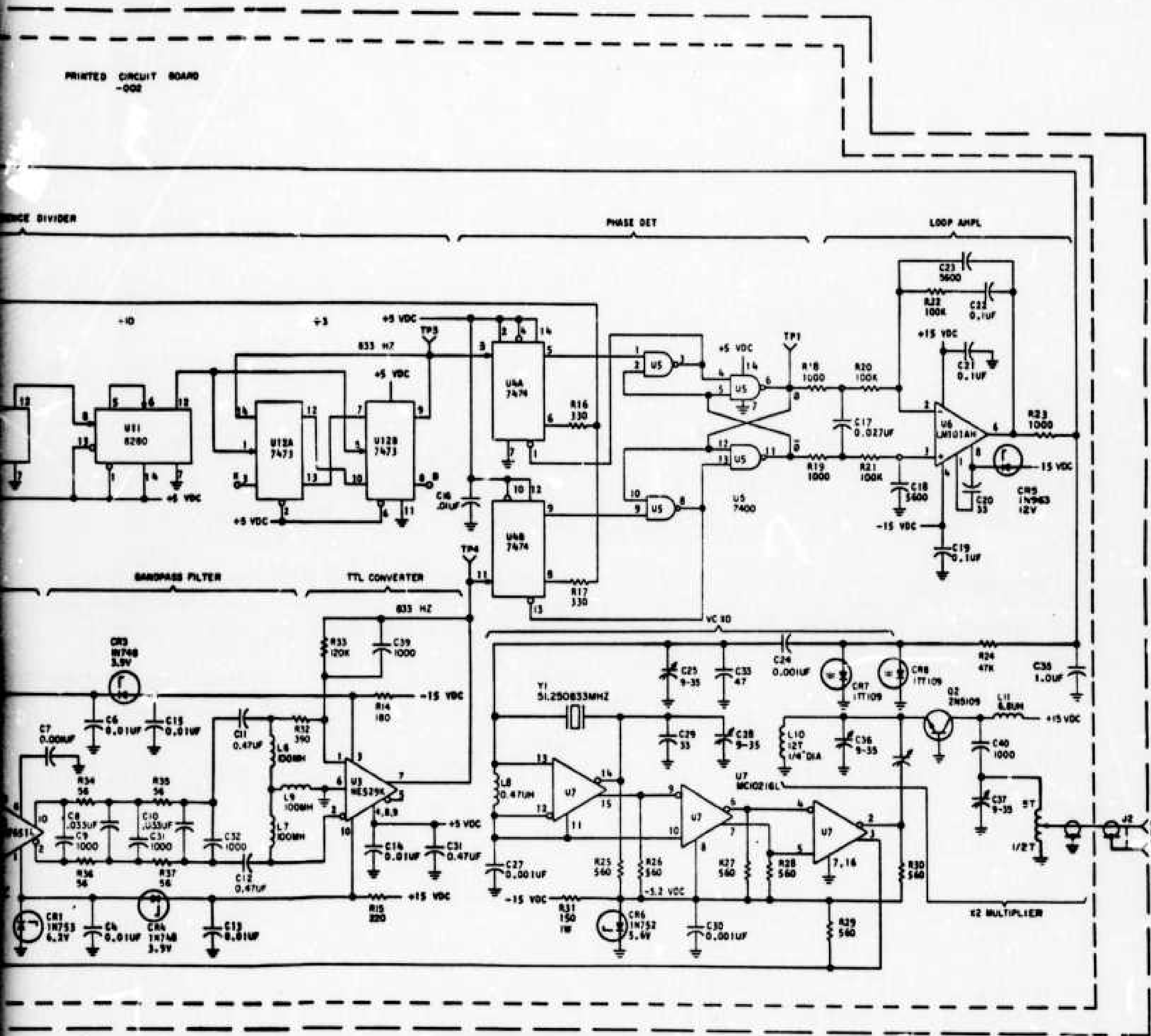


NEXT ASSY:

TYPE RD:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



-002

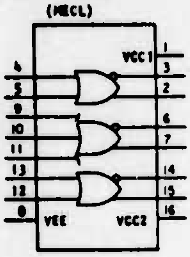
MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES. TOL ON: DEC DIM.: .XX ± .02, .XXX ± .008	PREP [signature] 11-9-73	DALLAS, TEX · NEWPORT BEACH CALIF · CEDAR RAPIDS, IA
	HOLE DIAMETERS: UNDER .251 DIA + .005-.005; .251 TO .500 DIA + .006-.005; OVER .500 DIA + .008-.005	CHK	SCHEMATIC DIAGRAM A7 1370MHZ RCV LOCAL OSCILLATOR PACKET RADIO
FINISH	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9557
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE NONE · SHEET 1 OF 2
	PART SHALL CONFORM TO 593-1400-001		

PRO ☐ NPP ☐ REL ☐ REV _ _ TC _ V CR 0 NO 0 DL 2 YO 0

B

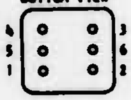
NOTES:

1. U1 MC10105L (MECL)



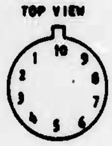
2. T1 2-MATCH HF 132

BOTTOM VIEW



3. U2 SN76514

TOP VIEW



1 +VCC
2 OUTPUT
3 FLOATING GND
4 LOCAL OSC INPUT
5. -VCC
6 DECOUPLE 1
7. DECOUPLE 2
8 RF INPUT
9 R C
10 OUTPUT

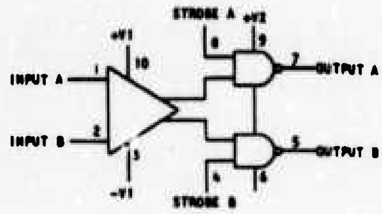
4. U9 THRU U11 N8280

TOP VIEW

1 DATA STROBE
2 C OUT
3 DATA C
4 DATA A
5 A OUT
6 CLOCK 2
7 GND
8 CLOCK 1
9 B OUT
10 DATA B
11 DATA D
12 D OUT
13 DATA RESET
14 VCC

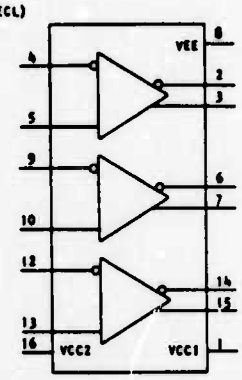
5. U3 NE529K

TOP VIEW

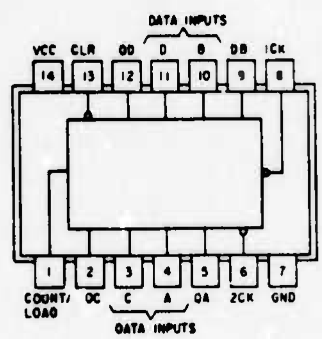


6. U7 MC10216L

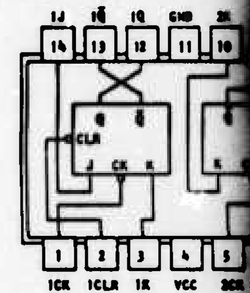
TRIPPLE DIFF AMP (MECL)



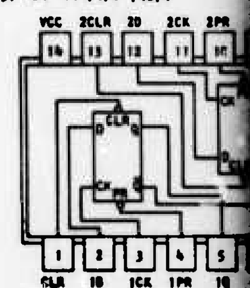
7. U8 N8291



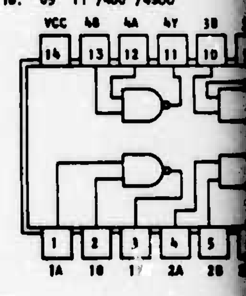
8. U12 TI 7473



9. U4 TI 7474 74S74



10. U5 TI 7400 74S00

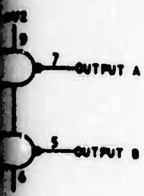


-002

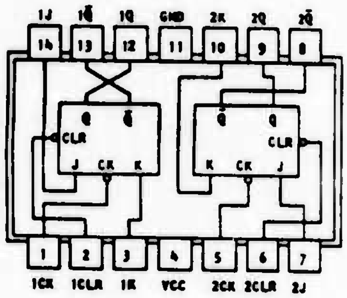
NEXT ASSY: TYPE NO:

A

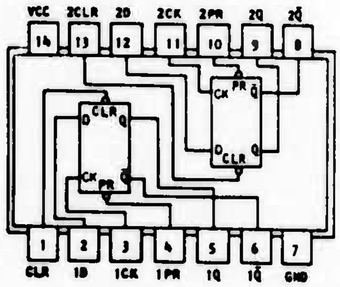
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



8. U12 TI 7473

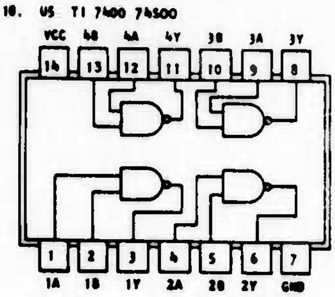


9. U4 TI 7474 74S74



11. UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS
ALL RESISTORS ARE 1/4 W CARBON
ALL CAPACITANCE VALUES ARE IN PICOFARADS.

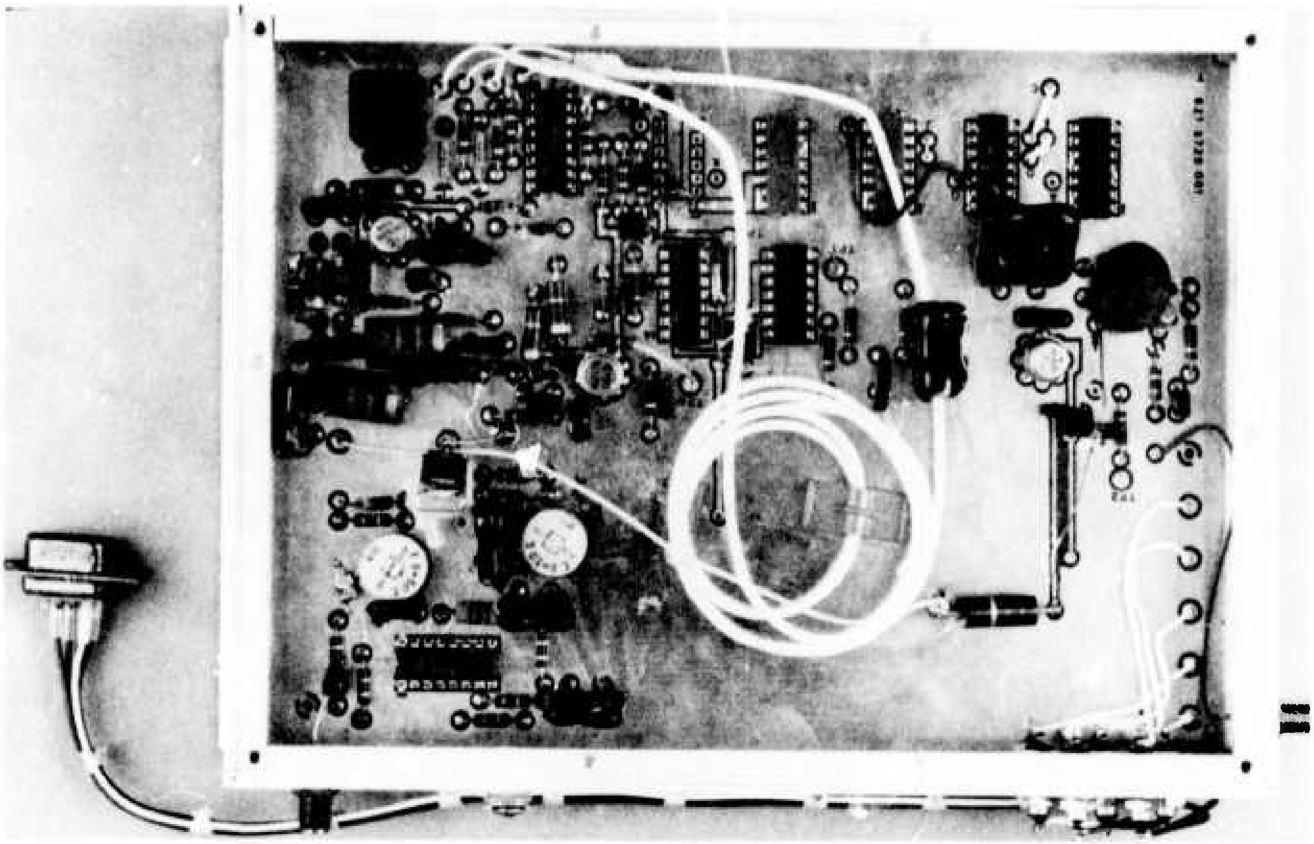
10. U5 TI 7400 74S00



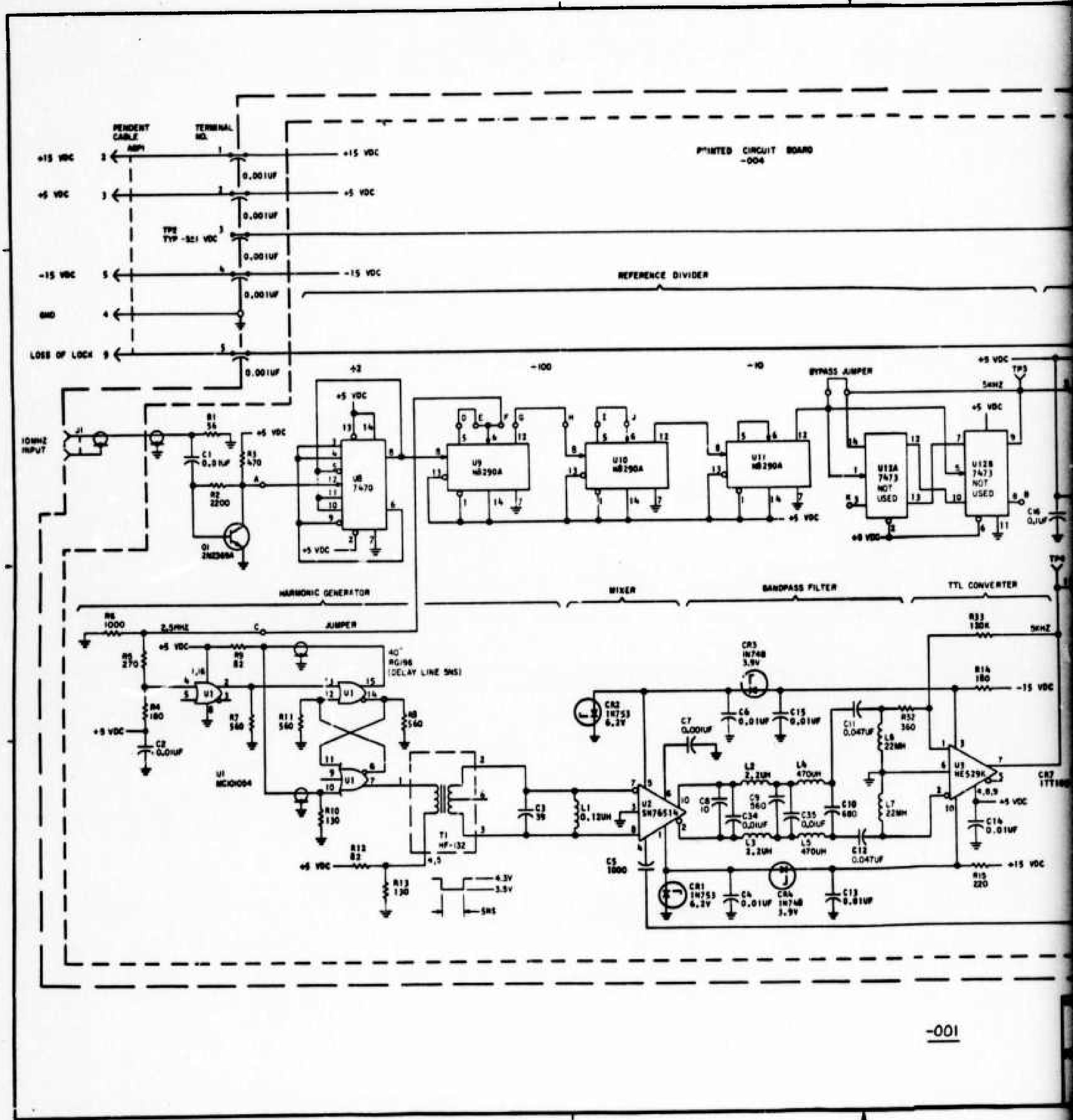
-002

SIZE	CODE IDENT	DWG NO
D	13499	627-9557
SCALE NONE	REV	SHEET 2 OF 2

B

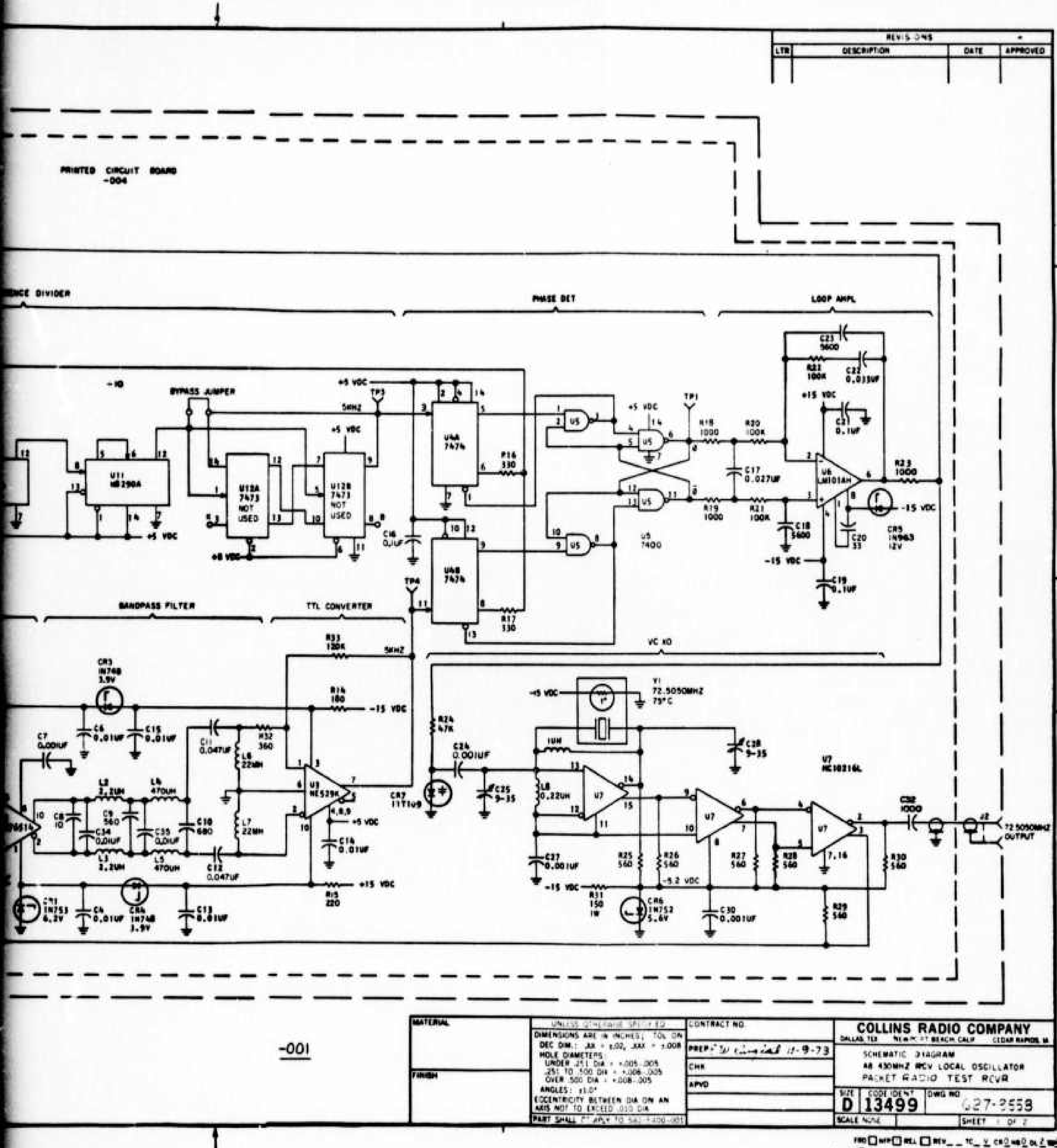


A8 - 430 MHZ RCV LO



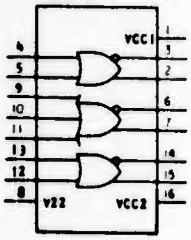
NEXT ASSY:
TYPE NO:

A


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PRINTED CIRCUIT BOARD
-004
DIVIDER
PHASE DET
LOOP AMPL
BYPASS JUMPER
5MHZ
+5 VDC
U11
U12A
7473
NOT USED
U12B
7473
NOT USED
U4A
7474
U4B
7474
U5
7400
U6
LM101AH
BANDPASS FILTER
TTL CONVERTER
VC XO
Y1
72.5050MHZ
79°C
U3
NE529K
U7
MC10216L
72.5050MHZ
OUTPUT
-15 VDC
+15 VDC
-5.2 VDC
-001
MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
CONTRACT NO.
PREP
11-9-73
CHK
APVD
COLLINS RADIO COMPANY
DALLAS, TEX
NEWPORT BEACH, CALIF
CEDAR RAPIDS, IA
SCHEMATIC DIAGRAM
AR 430MHZ RCV LOCAL OSCILLATOR
PACKET RADIO TEST RCVR
SIZE
D
CODE IDENT
13499
DWG NO
627-3558
SCALE NONE
SHEET 1 OF 2
B

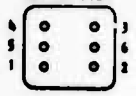
NOTES:

1. U1 MC10105L
(MECL)



2. T1 Z-MATCH MF 132

BOTTOM VIEW



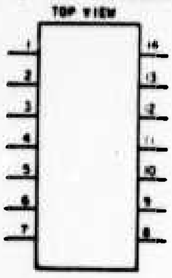
3. U2 SN76514

TOP VIEW

1 +VCC
2 OUTPUT
3 FLOATING GND
4 LOCAL OSC INPUT
5 -VCC
6 DECOUPLE 1
7 DECOUPLE 2
8 RF INPUT
9 R C
10 OUTPUT

4. U9 THRU U11 N8290A

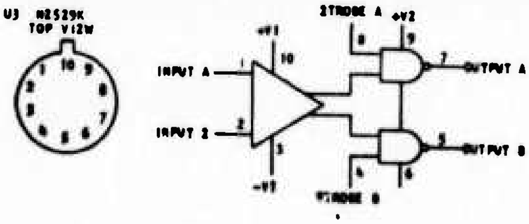
TOP VIEW



1 DATA STROBE
2 C OUT
3 DATA C
4 DATA A
5 A OUT
6 CLOCK 2
7 GND
8 CLOCK 1
9 B OUT
10 DATA B
11 DATA B
12 B OUT
13 DATA RESET
14 VCC

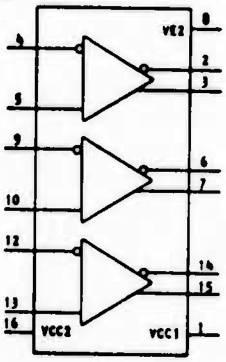
5. U3 NE529K

TOP VIEW

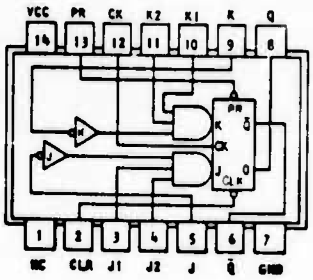


6. U7 MC10216L

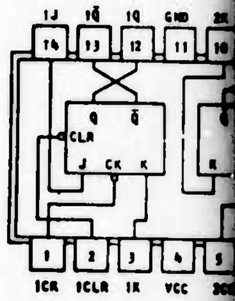
TRIPPLE DIFF AMP (MECL)



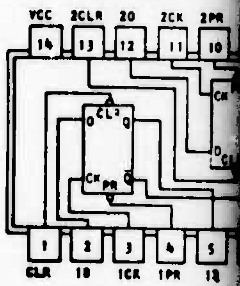
7. U8 TI 7470



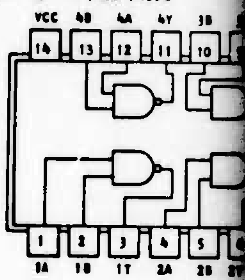
8. U12 TI 7473



9. U4 TI 7474 74S74

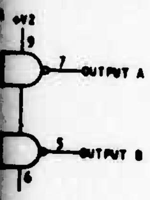


10. U5 TI 7400 74S00



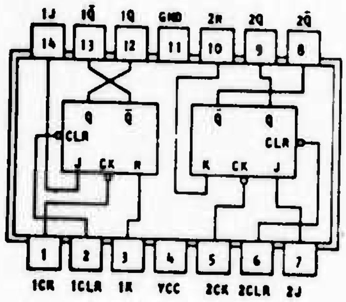
NEXT ASSY: TYPE NO:

A

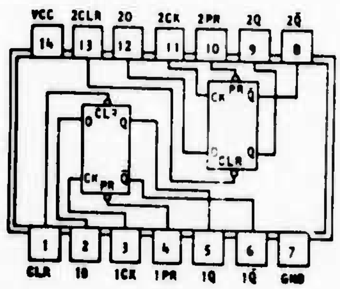


REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

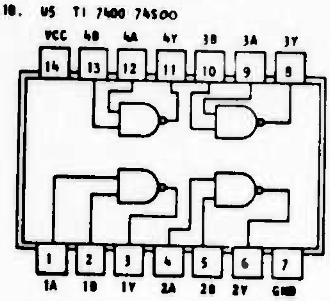
8. U12 TI 7473



9. U4 TI 7474 74S74



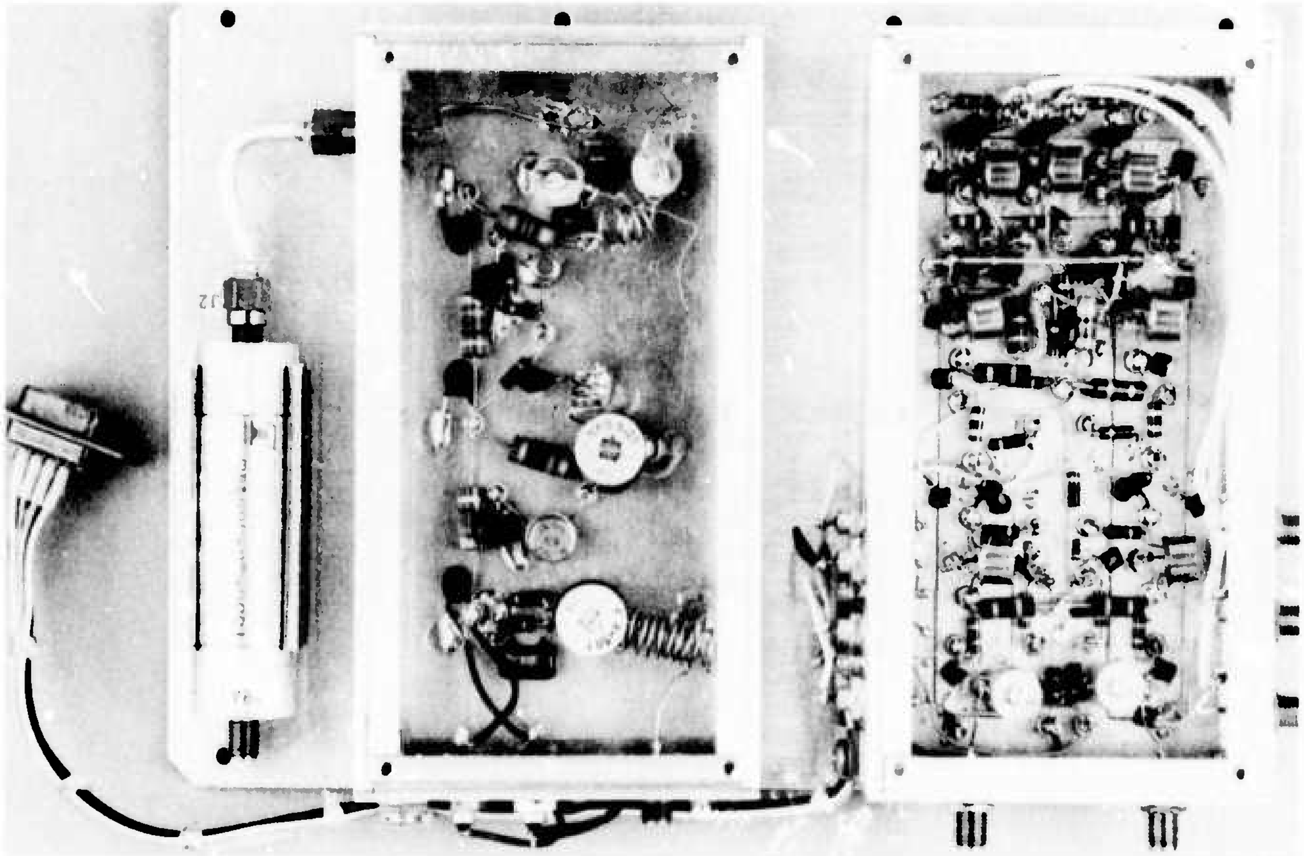
10. U5 TI 7400 74S00



11. UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS
ALL RESISTORS ARE 1/4 W CARBON
ALL CAPACITANCE VALUES ARE IN PICOFARADS.

SIZE	CODE IDENT	DWG NO
D	13499	627-3558
SCALE NONE	REV	SHEET 2 OF 2

B



A9A1 - Signal Splitter/Combiner

NOTES:

1. AT-1 AND AT-2 ARE PARASITIC SUPPRESSOR FERRITE BEADS ON COLLECTOR LEADS OF Q-3 AND Q-4.
2. GP-1, GP-2 AND GP-3 ARE AF GROUND PLANES WHICH ARE CAPACITY COUPLED TO DC AND AF GROUND BUT ARE BIASED FROM DC GROUND. RF SWITCHING BETWEEN CH 1 AND CH 2 IS ACCOMPLISHED BY BIASING CHANGE ON THESE GROUND PLANES.
3. ALL TRANSISTORS (Q-1 THRU Q-7) ARE TYPE 2N5109.
4. WINDING DETAIL FOR TRANSFORMERS T-1 THRU T-8

3 TURNS BIFILAR #26 HEAVY FORMVAR INSULATED WIRE ON Q-2 FERRITE TOROID CPN 288-0089-00

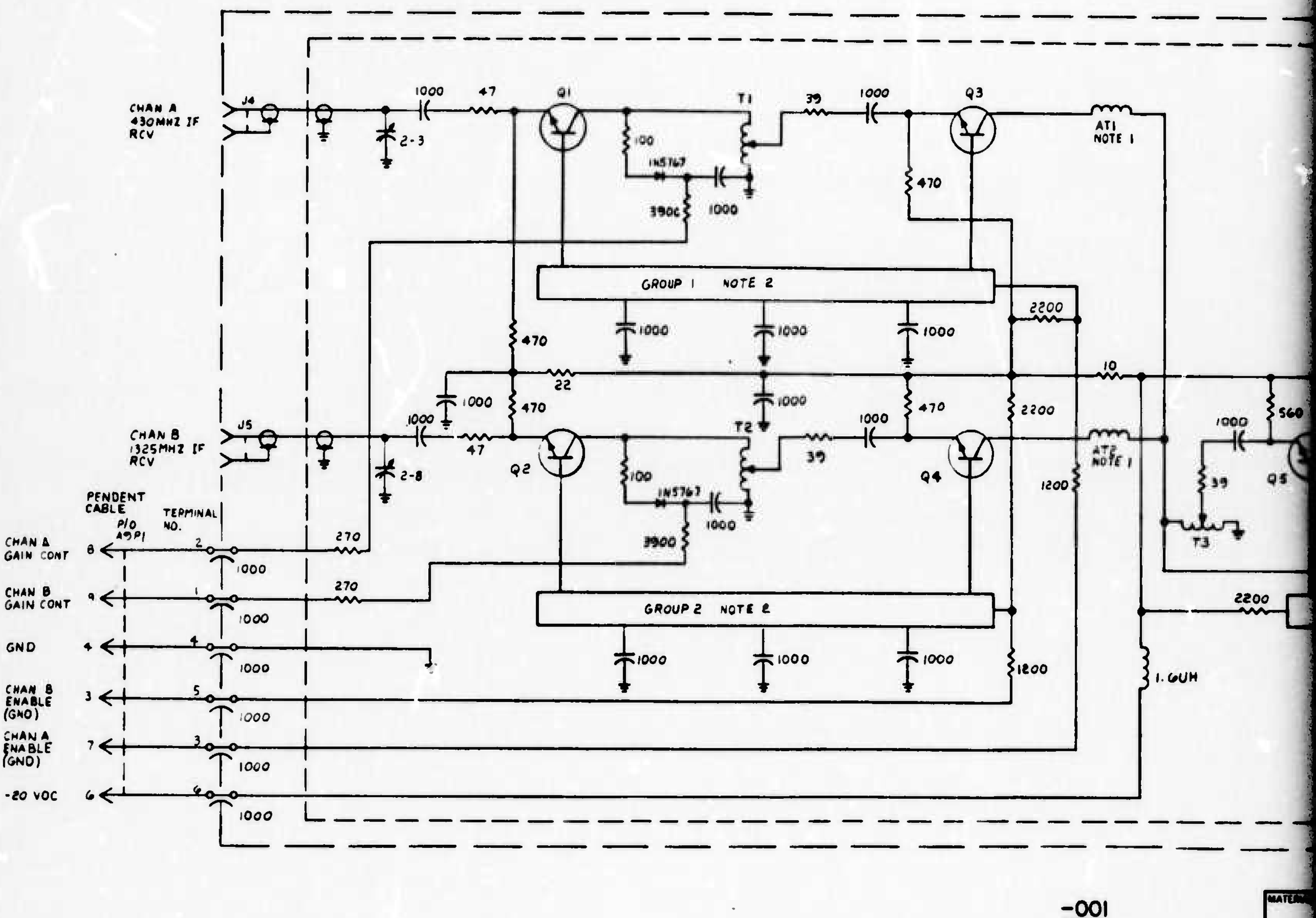
1 START, 2 START, 2 FINISH, 1 FINISH

LEADS 3/4" MIN STRIP AND TIN

CONNECTION DETAIL

1 START, 2 FINISH, 1 FINISH TO 2 START, SOLDER AND TRIM TO 3/4" LENGTH

5. PENDENT CABLE AO 22 TEFLON WIRE, (NO) REPRESENTS COLOR CODE.
6. UNLESS OTHER SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS ALL CAPACITANCE VALUES ARE IN PICOFARADS.



-001

MATERIAL

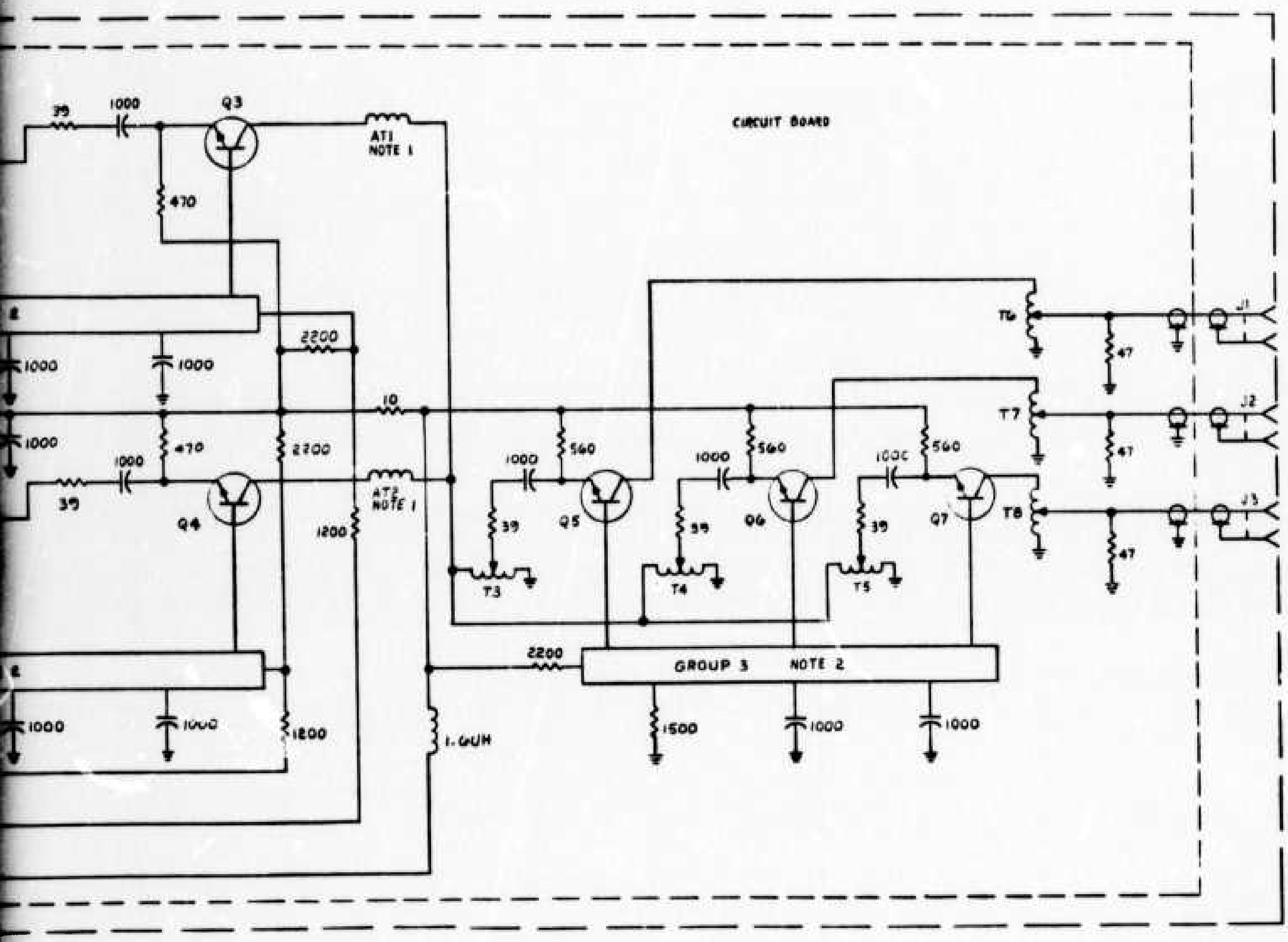
FINISH

NEXT ASSY:

TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

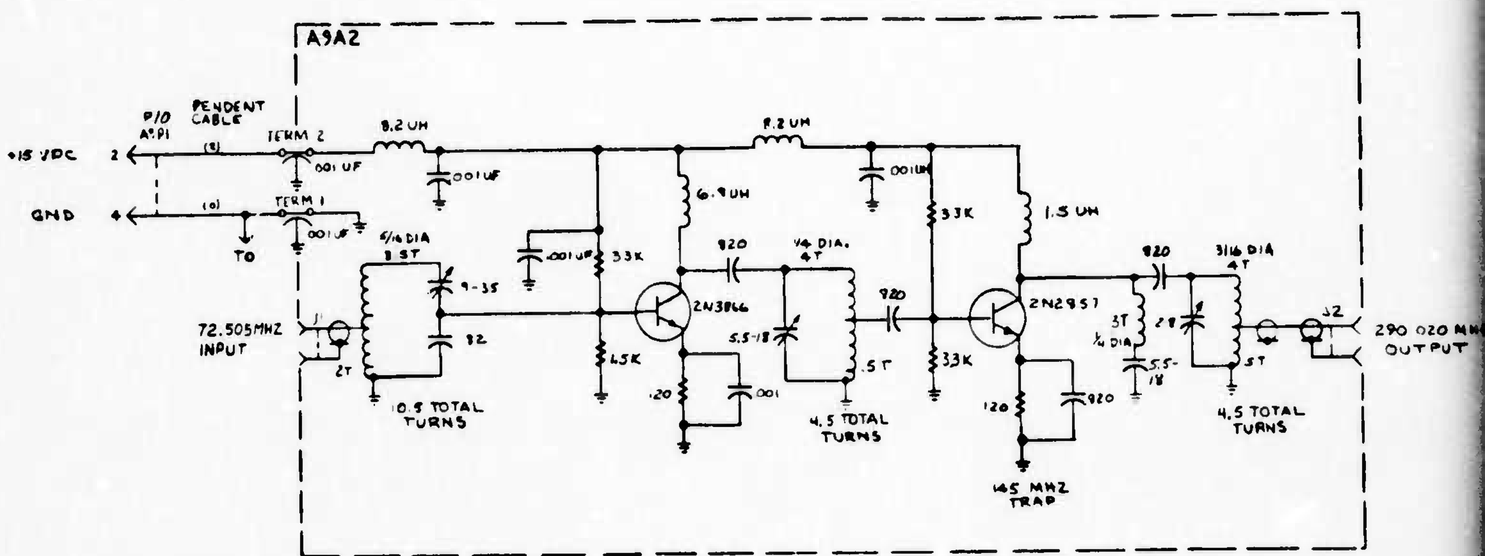


-001

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005 .005 .251 TO .500 DIA = +.006 .005 OVER .500 DIA = +.008 .005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	PREP	SCHEMATIC DIAGRAM 49A1 SIGNAL SPLITTER AND GAIN CONT PACKET RADIO TEST RCVR
FINISH		CHK	
		APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9659
	PART SHALL COMPLY TO		SCALE · SHEET

B

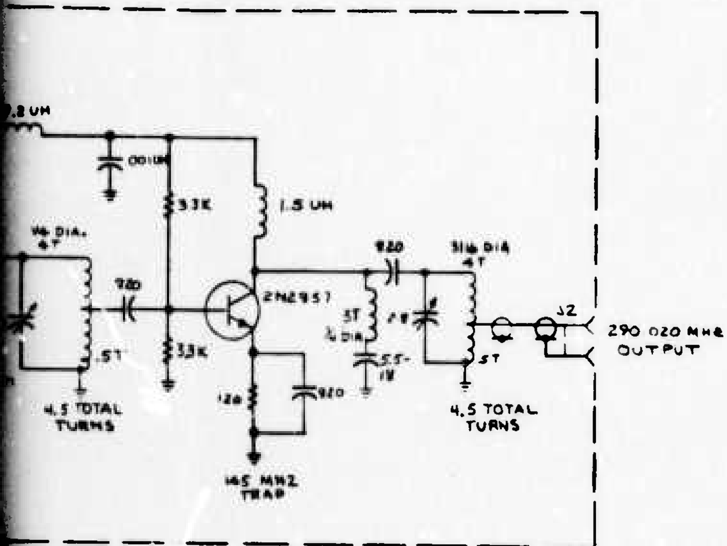
NOTES:
1. COILS WOUND WITH #20 BUSS WIRE
2. PENDENT CABLE NO 22 TEFLON WIRE, (NO) REPESENTS COLOR CODE
3. UNLESS OTHERWISE NOTED ALL CAPACITORS IN PICOFARADS



NEXT ASSY: TYPE NO:

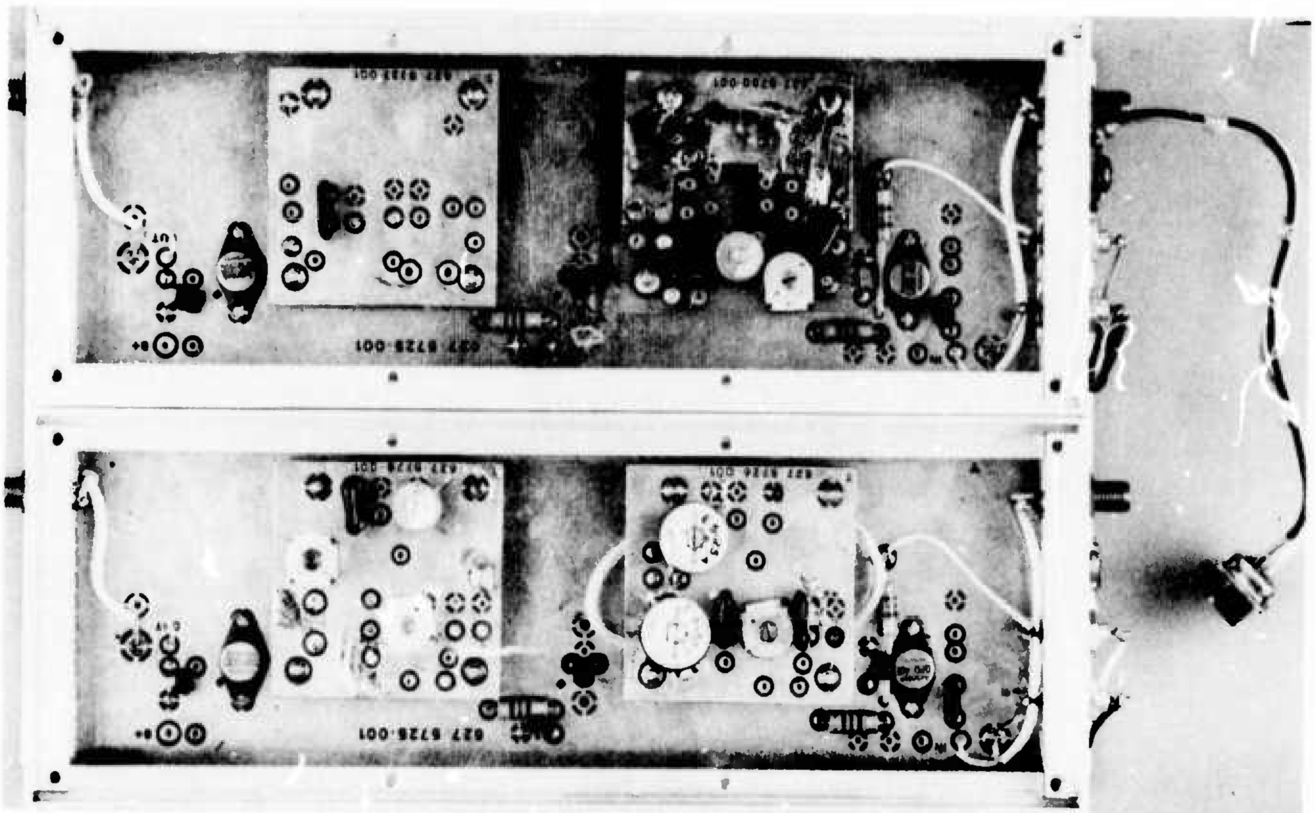
A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP TONY FITE 3-11-73	DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
	HOLE DIAMETERS: UNDER .251 DIA = +.005 .005; .251 TO .500 DIA = +.006 .005; OVER .500 DIA = +.008 .005	CHK	WIRING DIAGRAM A9A2 MULTIPLIER X4 PACKET RADIO TEST RCVR
FINISH	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9659
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE NONE · SHEET 2 OF 2
	PART SHALL COMPLY TO		

B



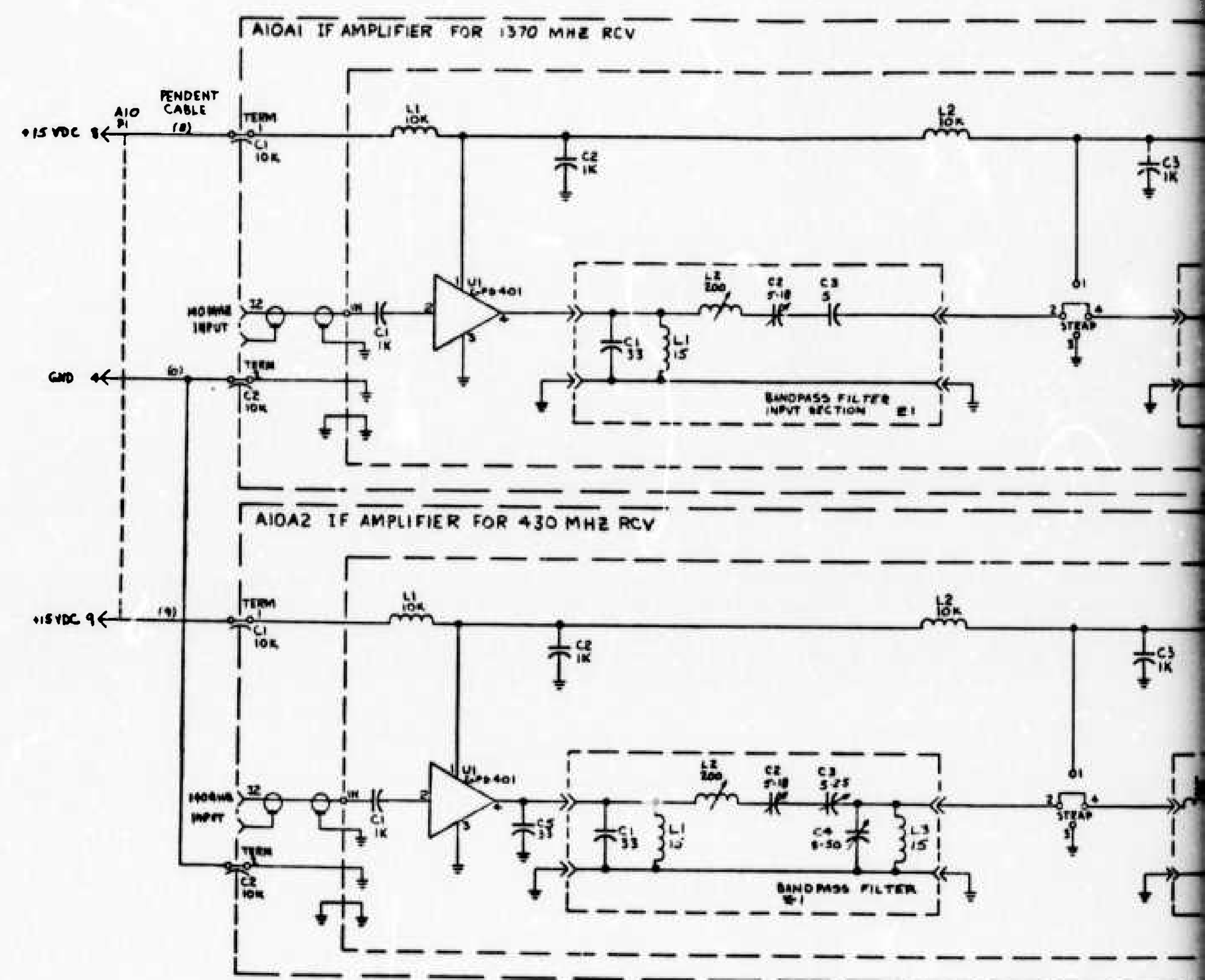
A10 - IF AMPL.

NOTES:

1. ALL CAPACITORS ARE IN PF
2. ALL INDUCTORS ARE IN UH
3. GPD 401/402 BOTTOM VIEW

   1. +15 VDC
   2. RF INPUT
   3. GND
   4. RF OUTPUT

4. PENDENT CABLE NO. 22 TEFLON WIRE. (NO) REPRESENTS COLOR CODE.

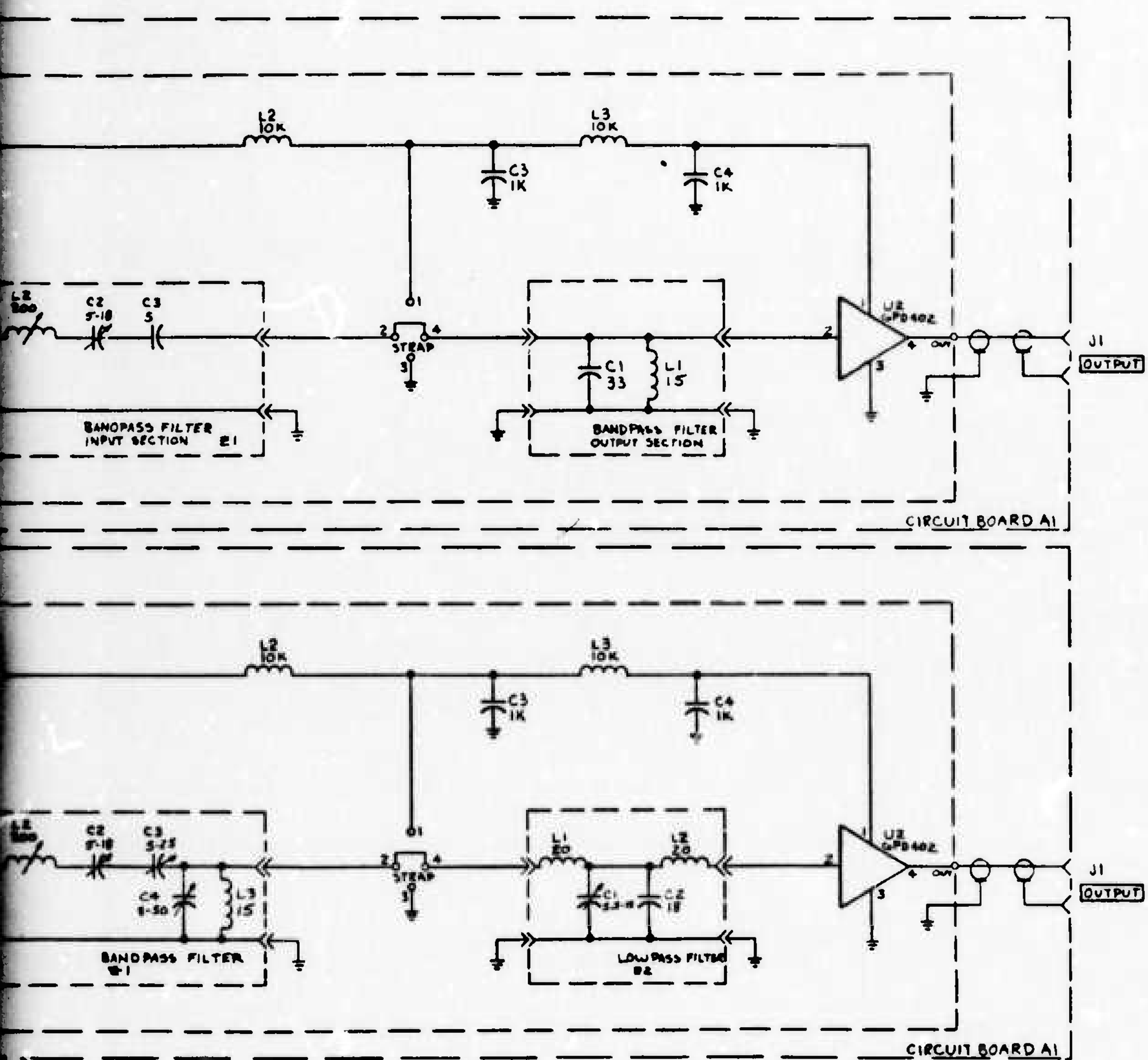


NEXT ASSY:

TYPE NO:

A

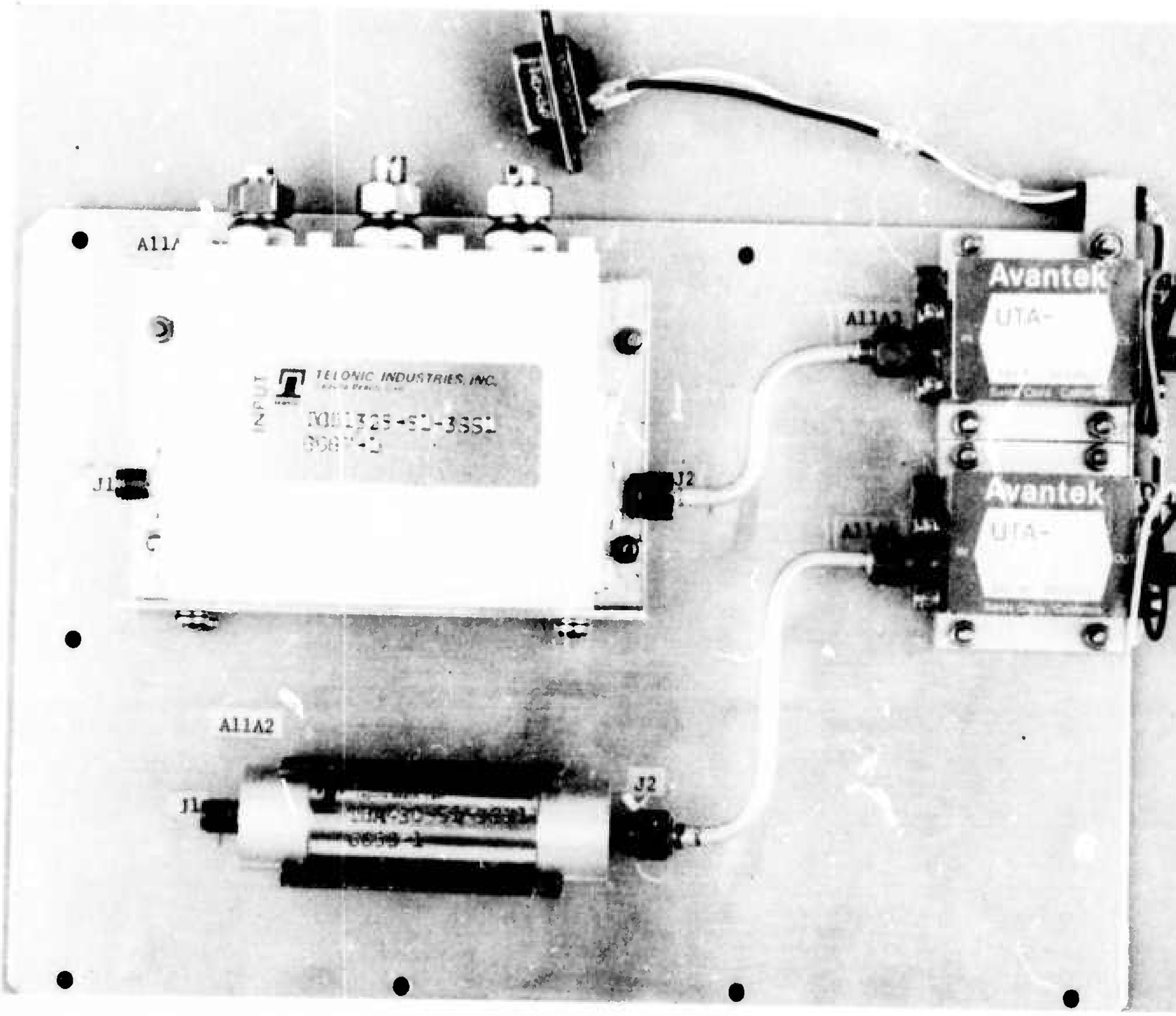
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



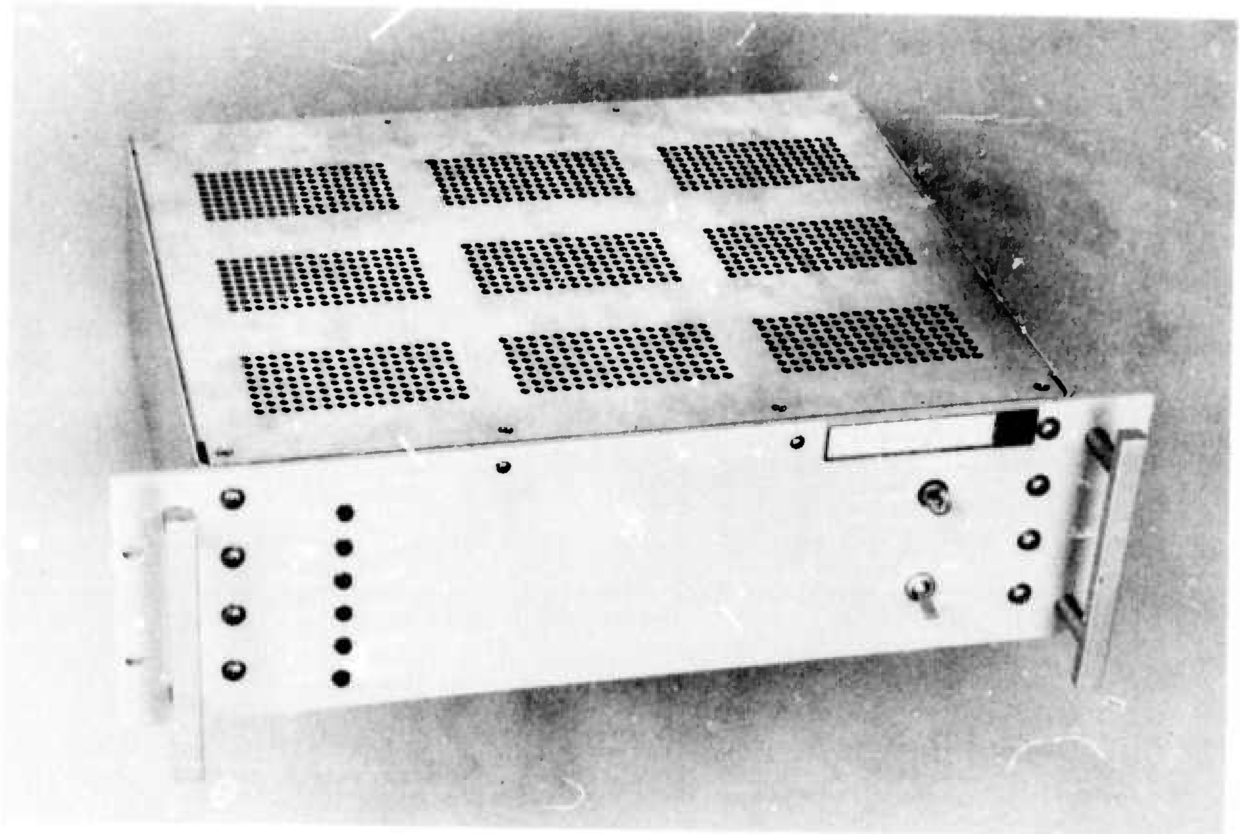
-001

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005 .005 .251 TO .500 DIA = +.006 -.005 OVER .500 DIA = +.008 -.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	PREP T FITE 11-9-71	DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
FINISH		CHK	SCHEMATIC DIAGRAM 4DA1,4DA2 140MHZ IF AMPLIFIER PACKET RADIO TEST RCVR
		APVD	SIZE D CODE IDENT 13499 DWG NO 627-9560
	PART SHALL COMPLY TO SHO 54 0 C01		SCALE SHEET

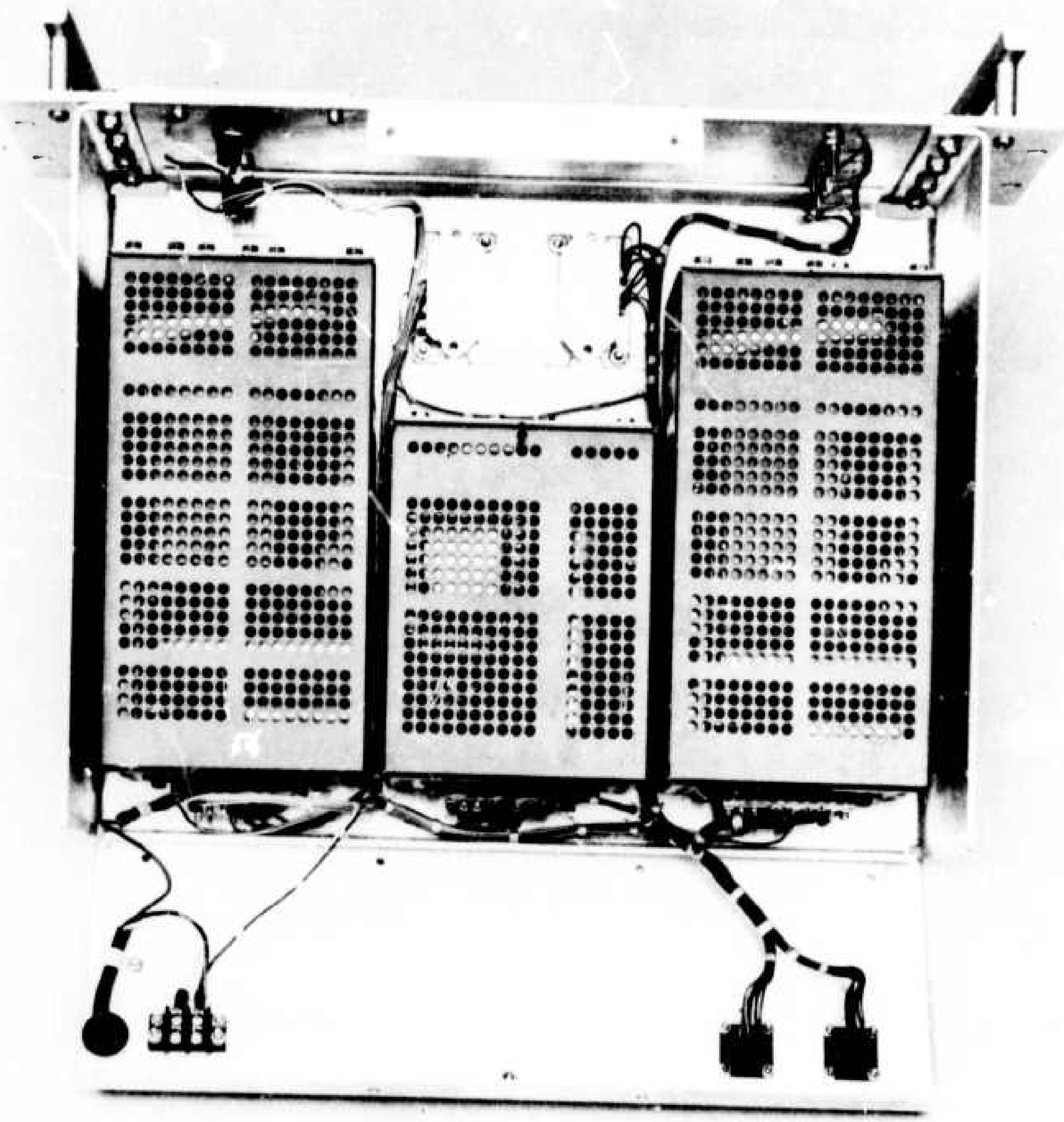
B



A11 - RF AMPL & FILTER



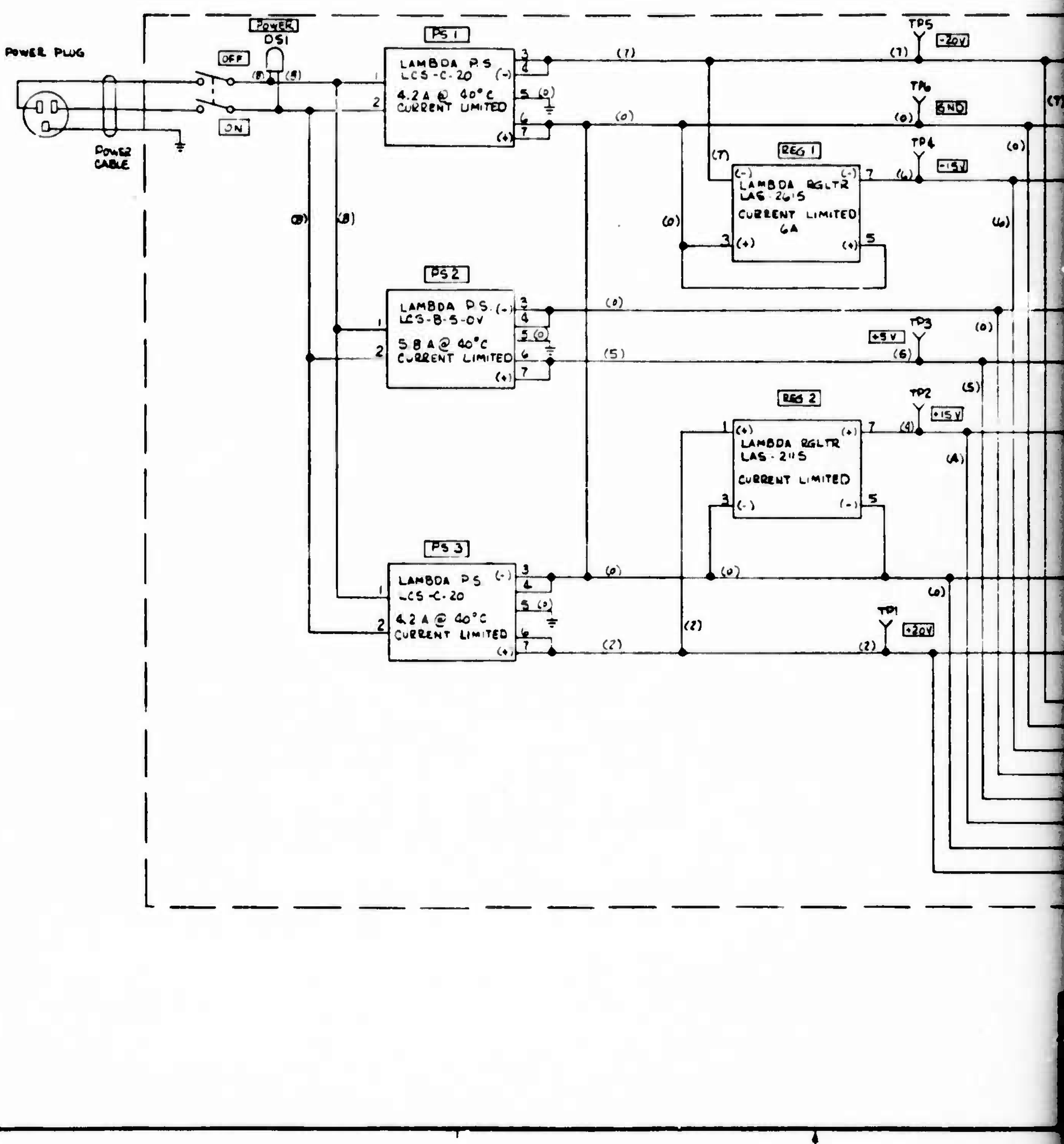
Front View



Internal Assy

NOTES:

1. ALL CHASSIS ITEMS TO BE IDENTIFIED BY RUBBER STAMP OR OTHER MEANS ON CHASSIS.
2. NO 20 TEFLON WIRE TO BE USED UNLESS OTHERWISE NOTED. (X) INDICATE WIRE COLOR CODE.

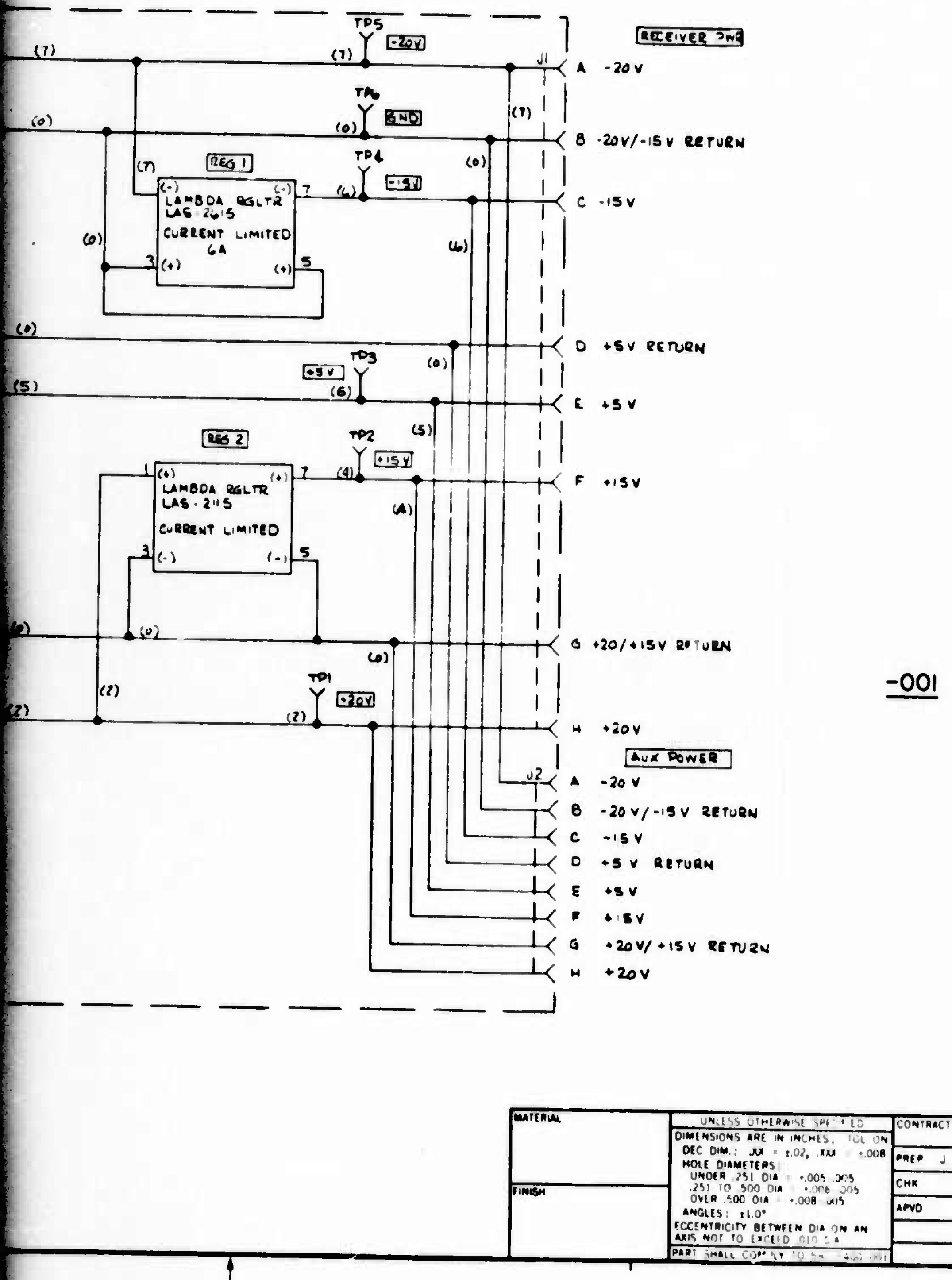


NEXT ASSY

TYPE NO.

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

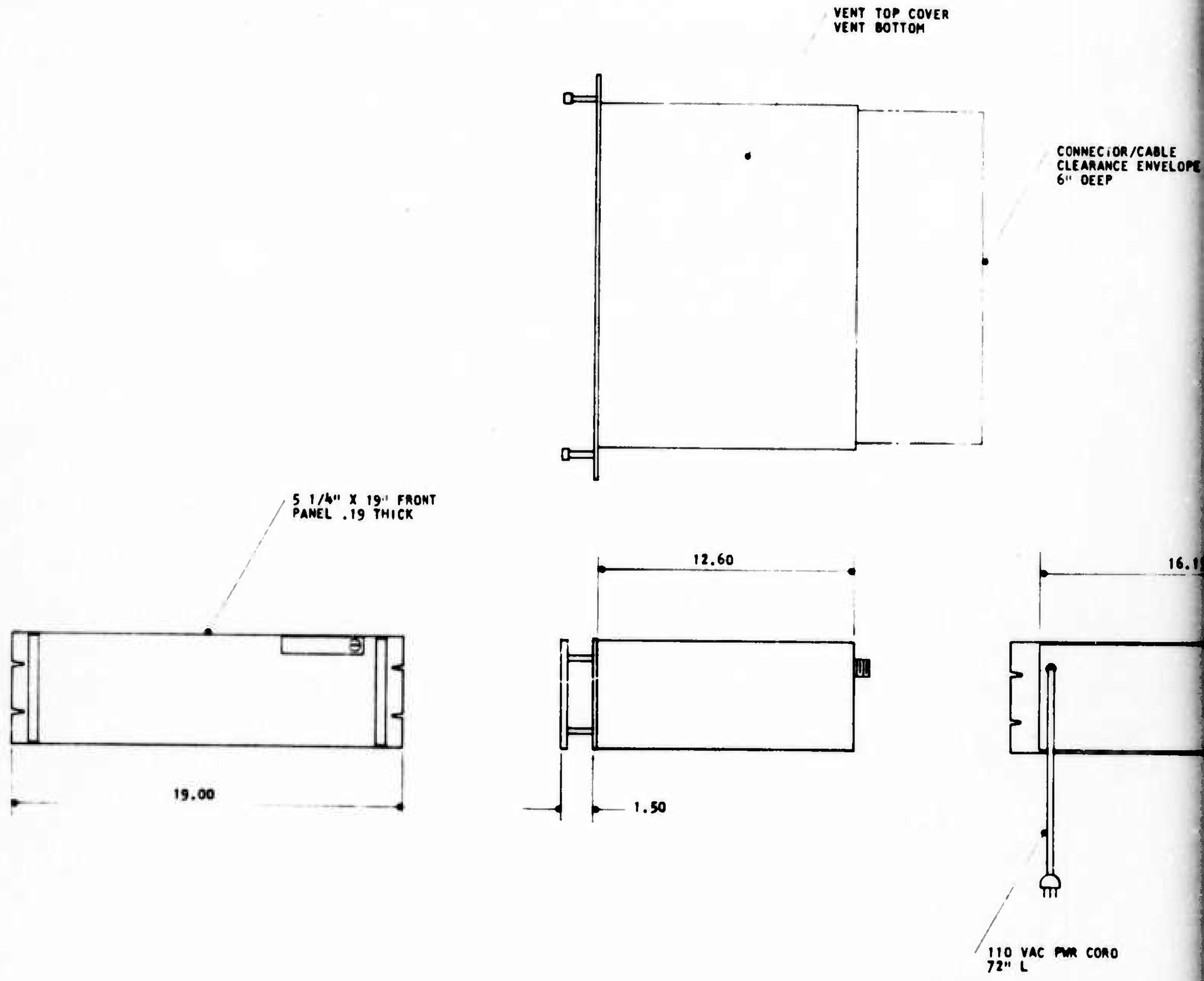


MATERIAL	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES, TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008; HOLE DIAMETERS: UNDER .251 DIA +.005 .005; .251 TO .500 DIA +.006 .005; OVER .500 DIA +.008 .005; ANGLES: ±1.0°; ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 FIM; PART SHALL CONFORM TO	CONTRACT NO	COLLINS RADIO COMPANY — DALLAS TEX, NEWPORT BEACH CALIF, CEDAR RAPIDS IA
FINISH		PREP J M RILEY 11-5-73	WIRING DIAGRAM RCVR POWER SUPPLY PACKET RADIO TEST SET
		CHK	SIZE D — CODE IDENT 13499 — DWG NO 627-9653
		APVD	SCALE — SHEET

B

NOTES:

1. UNIT WEIGHT IS 34 POUNDS.
2. POWER REQUIRED IS 110V AC   WATTS.
3. PART NUMBER FOR THIS UNIT IS 027-9555-001.



QTY	ITEM NO.	PART OR IDENTIFYING NO	NAME
	DASH NO		PA

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
N/A	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP D. DELFELO
	HOLE DIAMETERS: UNDER .251 DIA = +.005-.005; .251 TO .500 DIA = +.006-.005; OVER .500 DIA = +.008-.005	CHK
FINISH	ANGLES: ±1.0°	APVD R. A. Herrick
N/A	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	
	PART SHALL COMPLY TO 580-5400-001	

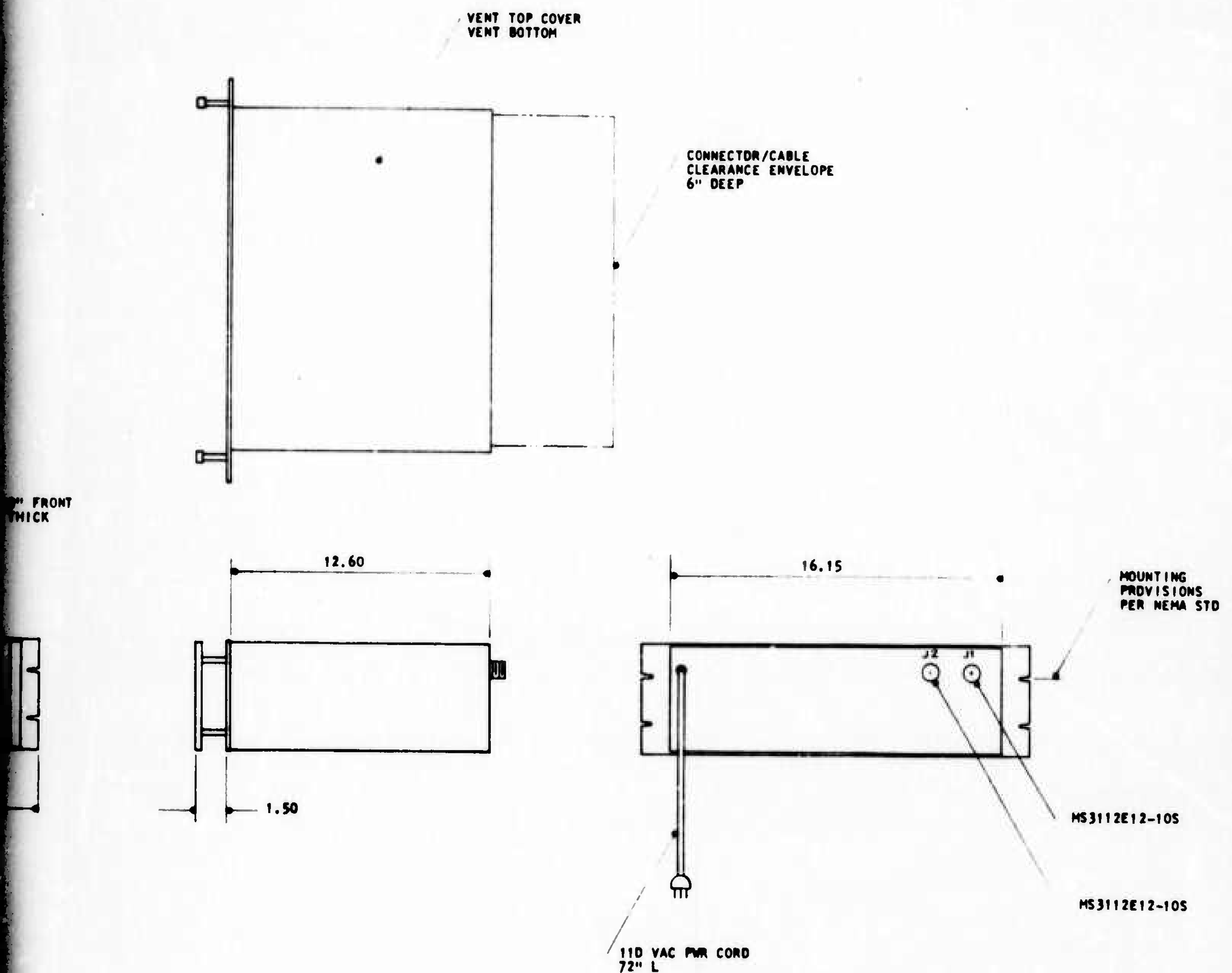
NEXT ASSY:

TYPE NO:

A

B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

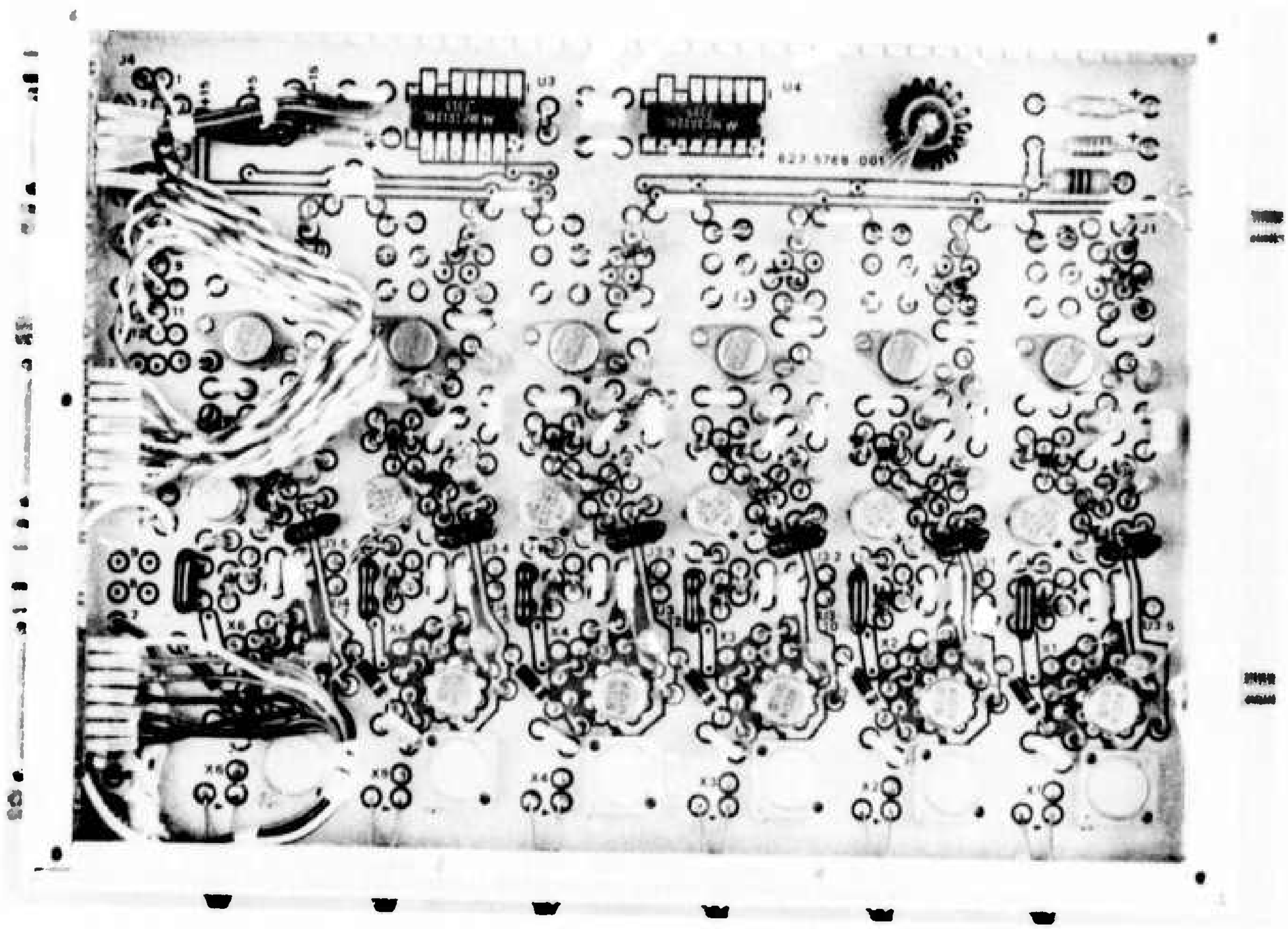


QTY	ITEM NO.	PART OR IDENTIFYING NO	NAME	DESCRIPTION	UM	MN	ALTN PREF
	DASH NO.	PARTS LIST					

MATERIAL N/A	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	CONTRACT NO. PREP D. DELFELD 11/19/73 CHK APVD R. A. Herrick	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA RECEIVER POWER SUPPLY-OUTLINE & INSTALLATION, PACKET RADIO TEST SET
FINISH N/A	PART SHALL COMPLY TO 580-5400-001		SIZE C · CODE IDENT 13499 · DWG NO 627-9574 SCALE 1/4 · SHEET

FRO ☐ NFP ☐ REL ☐ REV_ _ TC_ _ CR_ NB_ DL_ TO_

B

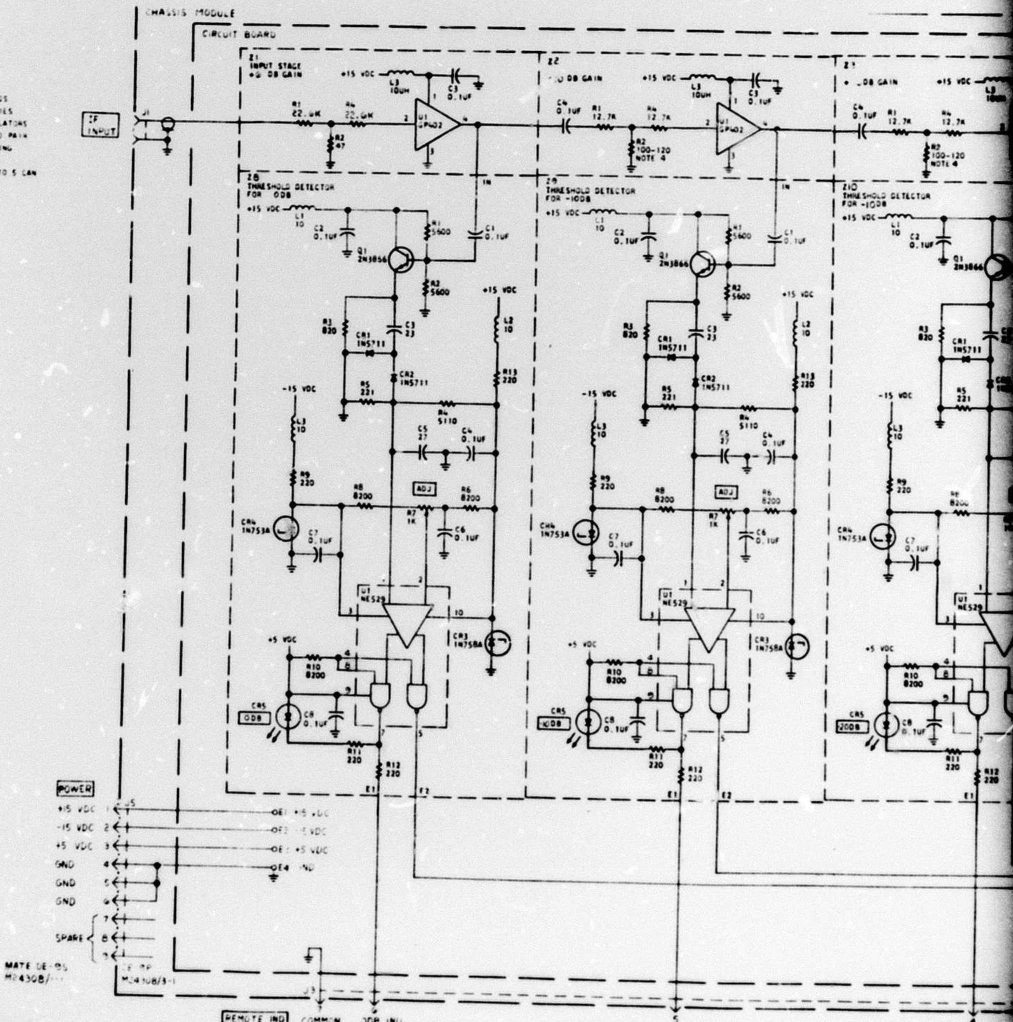


Assembly

NOTES:

1. UNLESS OTHERWISE SPECIFIED
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL RESISTORS ARE 1/4 W 10%
   ALL CAPACITANCE VALUES ARE IN PICOFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. U1 & U2 MC10124 ARE TTL TO MECL TRANSLATORS
   SUGGESTED APPLICATION IS TO USE TWISTED PAIR
   TO A MC10115/10116 DIFFERENTIAL RECEIVING
   DEVICE
3. U3 LM320-5V DC REGULATOR BOTTOM VIEW TO 5 CAN

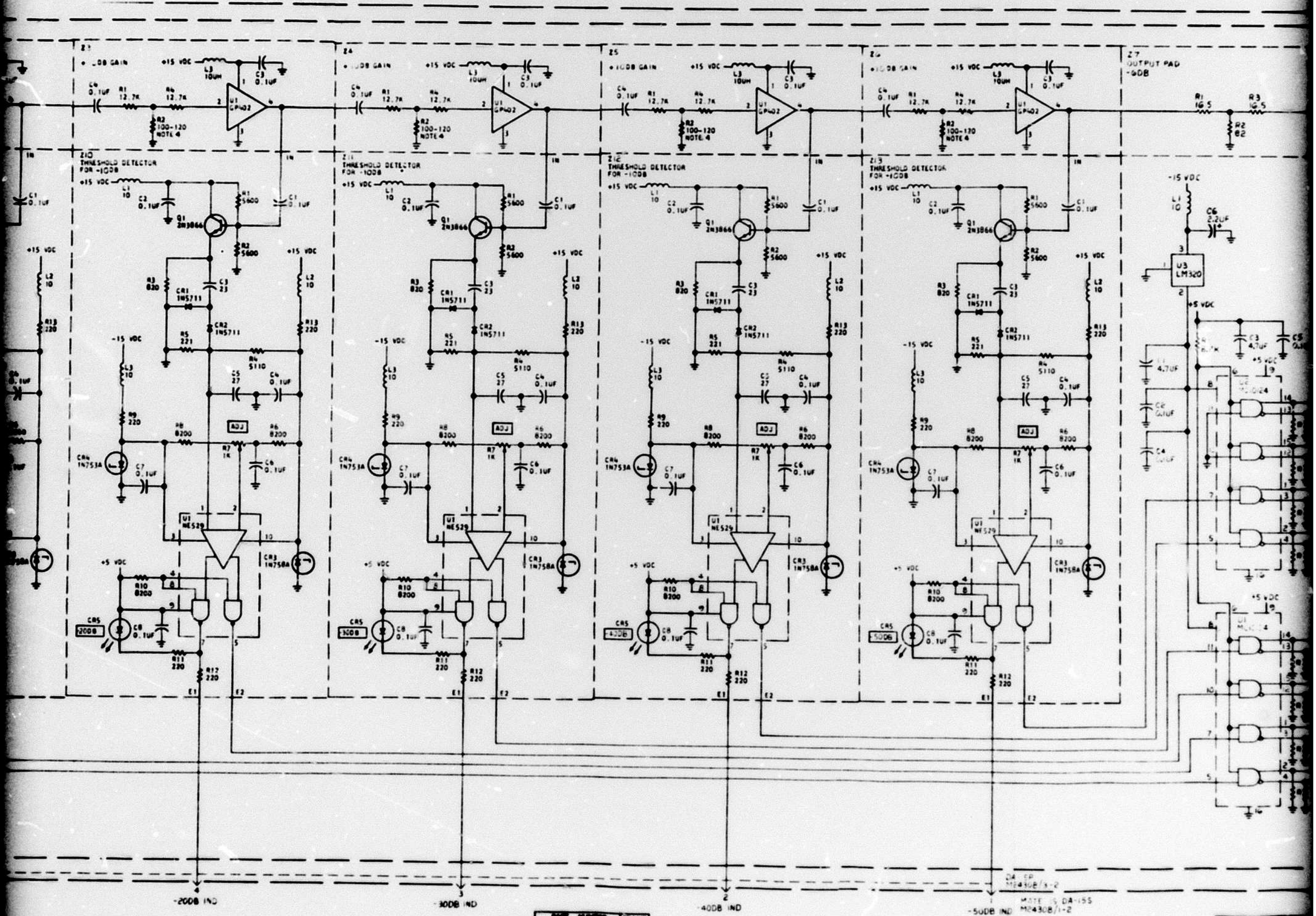
4. RESISTOR SELECTED FOR 10DB STAGE GAIN
5. RESISTORS MARKED "R" ARE 47 OHMS, 1/10 WATT



PART NUMBER	FRAME
227-9642	1/3

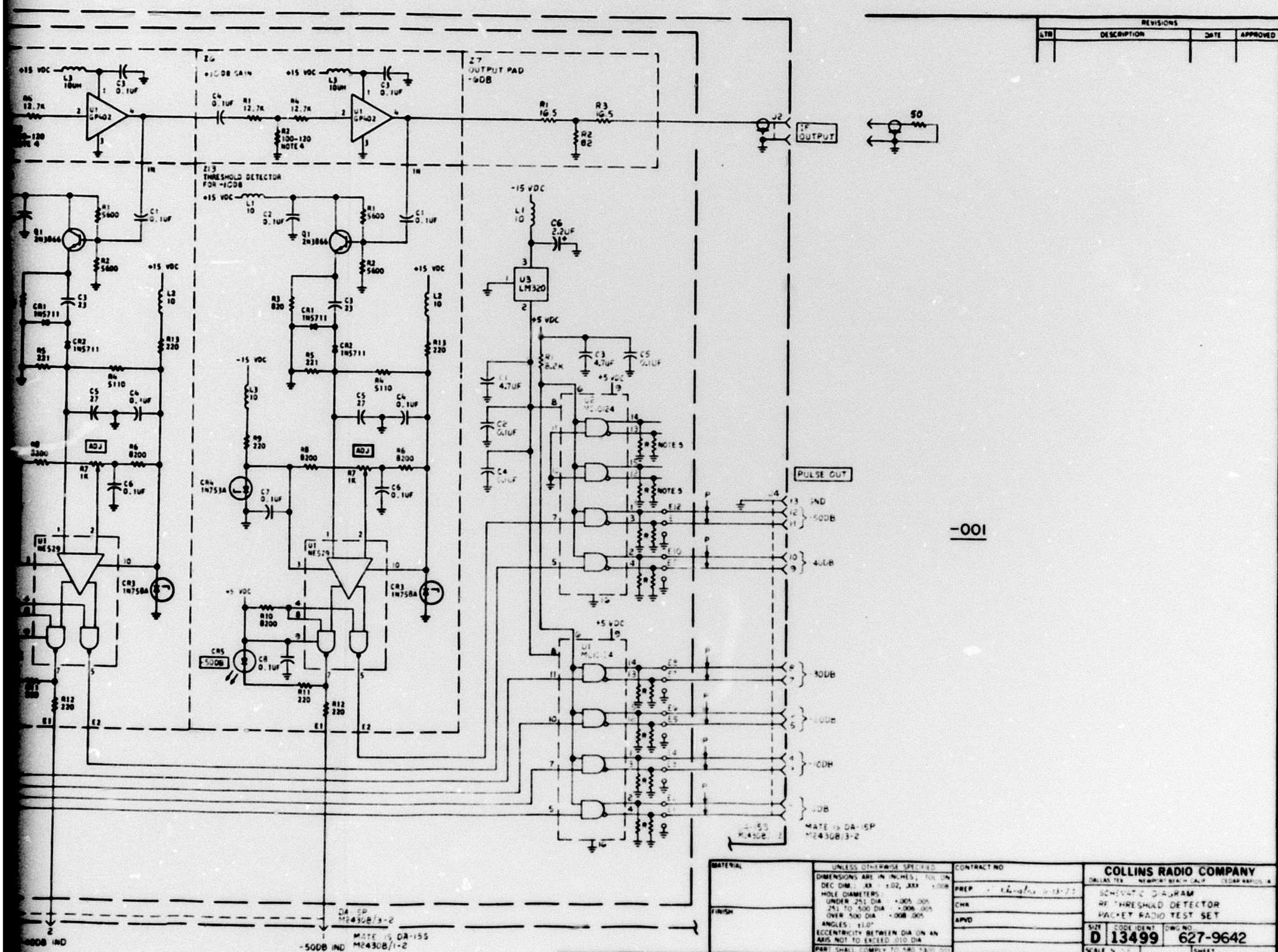
PART NUMBER	FRAME
.-7-9642	2/3

A



PART NUMBER 627-3642 FRAME 1/3

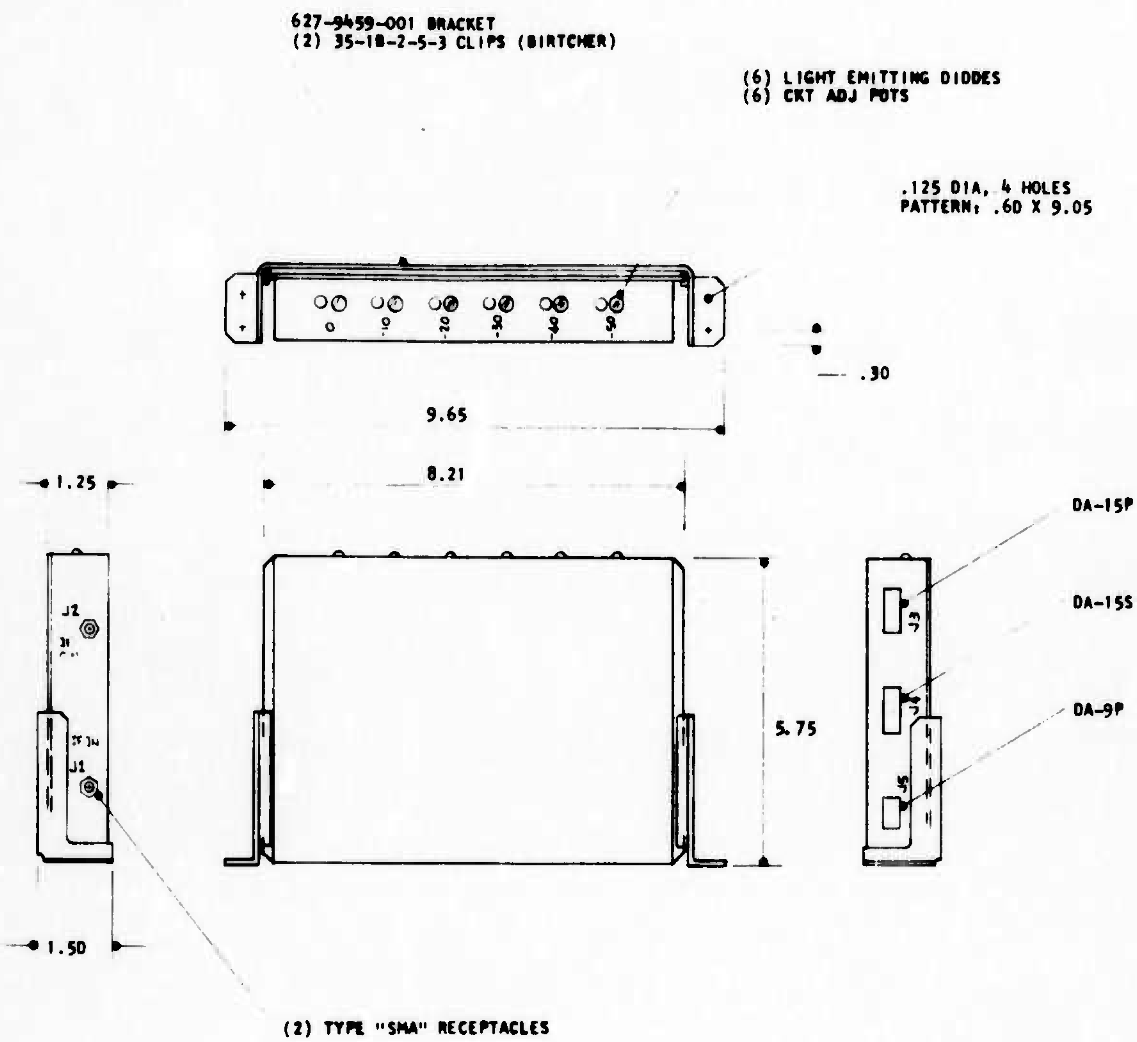
B



+10DB GAIN
OUTPUT PAD
-6DB
THRESHOLD DETECTOR
FOR -10DB
LM320
PULSE OUT
GND
-50DB
40DB
30DB
10DB
-001
IF OUTPUT
MATE IS DA-15P
M24308/3-2
MATE IS DA-15S
M24308/1-2
-50DB IND
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED
CONTRACT NO
PREP
CHK
APVD
COLLINS RADIO COMPANY
SCHEMATIC DIAGRAM
RF THRESHOLD DETECTOR
PACKET RADIO TEST SET
SIZE
D
CODE IDENT
13499
DWG NO
627-9642
SCALE
SHEET

NOTES:

1. WEIGHT OF UNIT IS 2 POUNDS.
2. POWER REQUIRED IS WATTS ± 15, +5VDC.
3. PART NUMBER OF MODULE IS 627-9564-001.



QTY	ITEM NO.	PART OR IDENTIFYING NO
	DASH NO.	

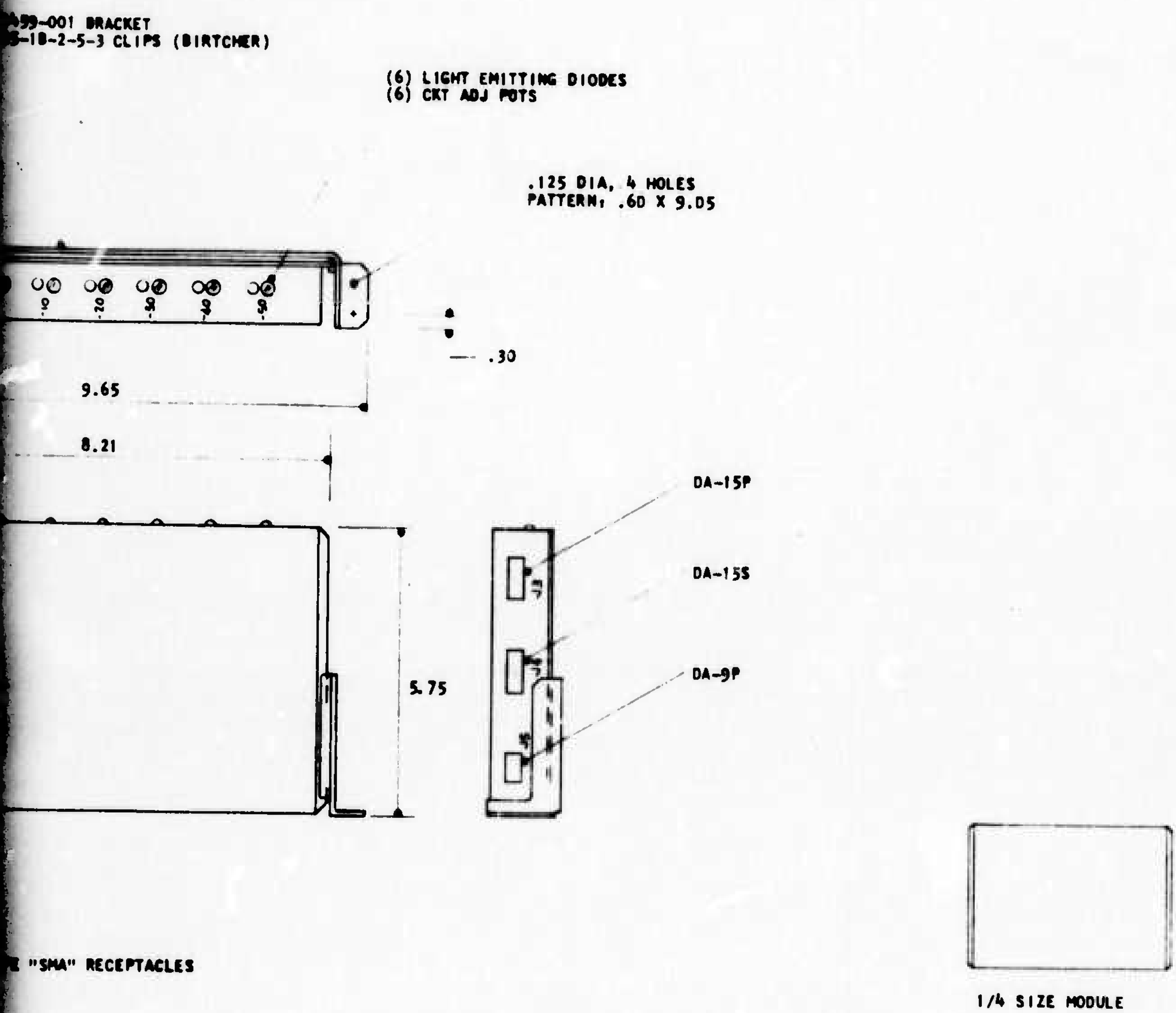
MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
N/A	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	PREP O. DELFELD
FINISH		CHK
N/A		APVD R A He...
	PART SHALL COMPLY TO 580-5400-001	

NEXT ASSY:

TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



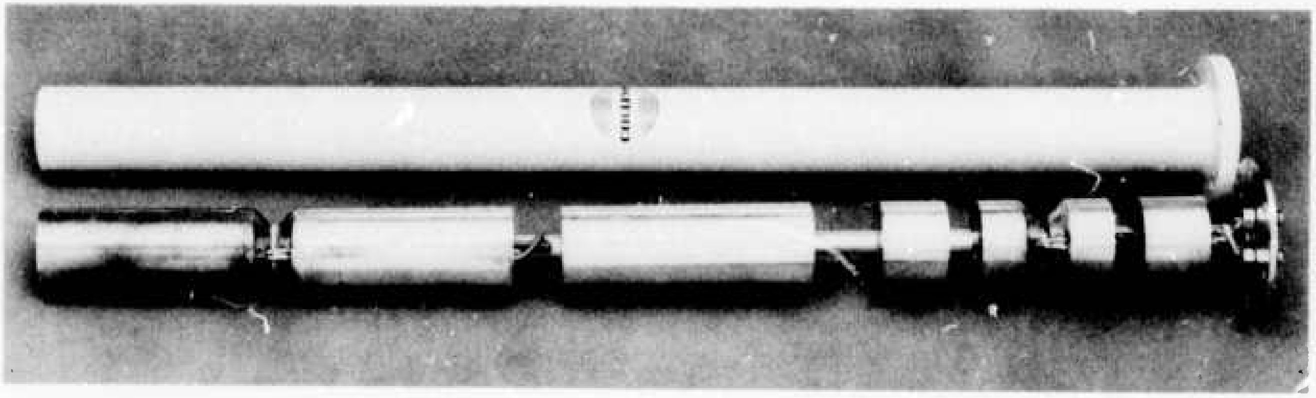
QTY	ITEM NO.	PART OR IDENTIFYING NO	NAME	DESCRIPTION	UM	MN	ALTN PREF
	DASH NO.	PARTS LIST					

MATERIAL N/A	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005 .005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	CONTRACT NO. PREP D. DELFELD 11/20/73 CHK APVD *R A He.. clc*	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA THRESHOLD, DETECTOR MODULE - OUTLINE & INSTALLATION PACKET RADIO TEST SET
FINISH N/A	PART SHALL COMPLY TO 580-5400-001		SIZE C · CODE IDENT 13499 · DWG NO. 627-9583 SCALE 1/2 & NOTED · SHEET

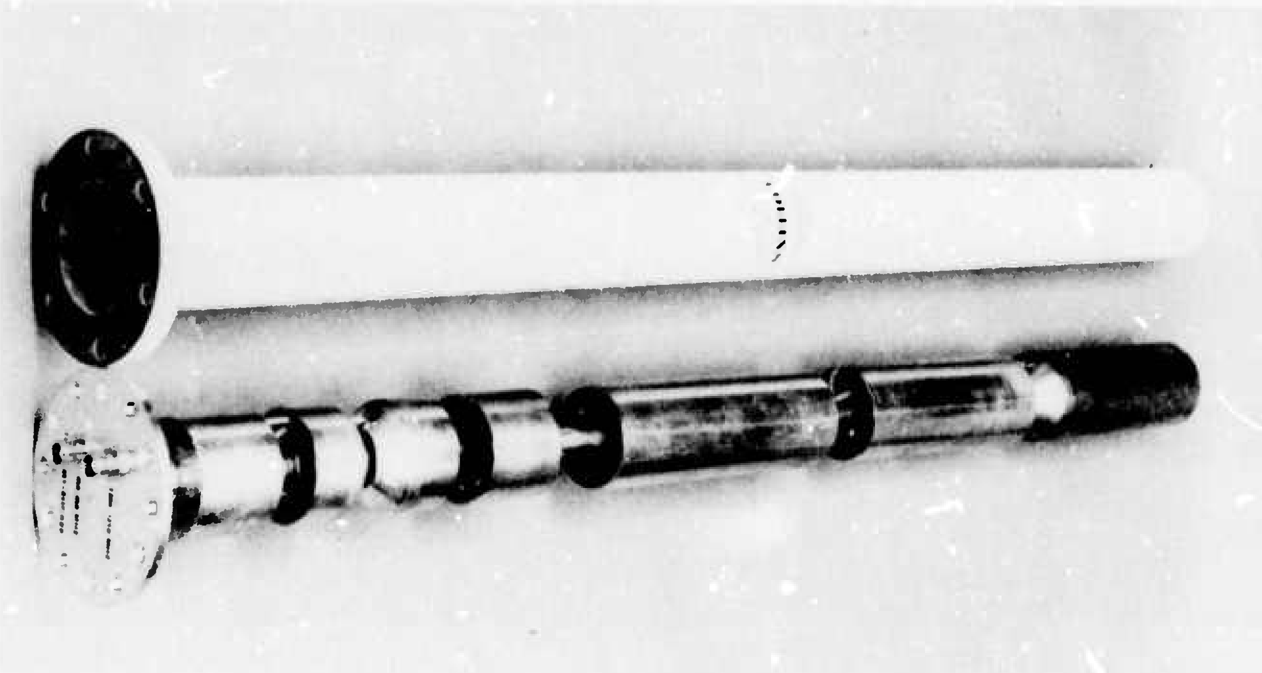
FRO ☐ NFP ☐ REL ☐ REV_ _ TC_ _ CR 0 NB 0 DL 2 TO 0

B

4A-85/4A-86

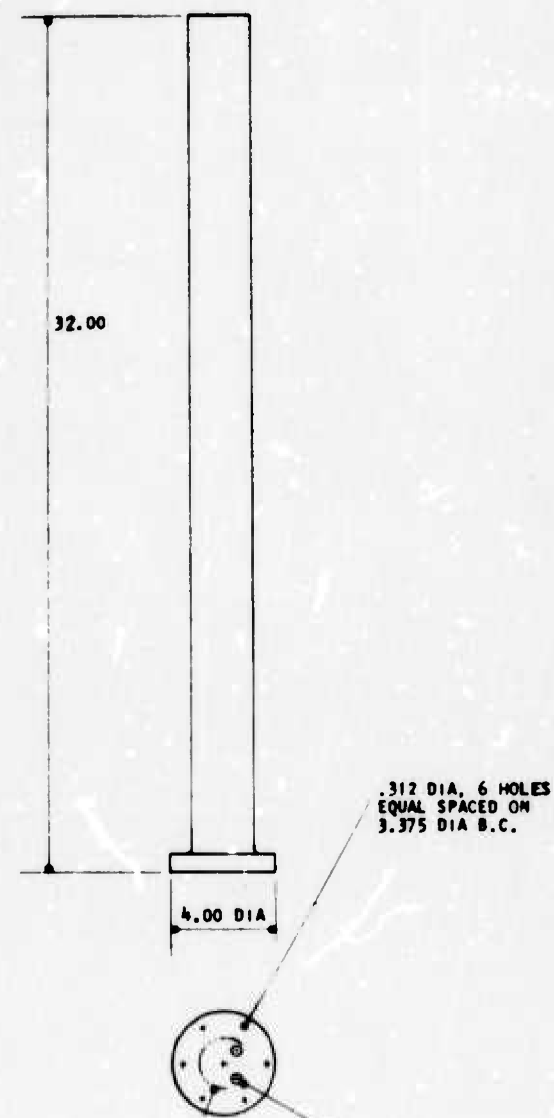


Assembly



Assembly

NOTES:
1. WEIGHT OF THIS UNIT IS 8 POUNDS.
2. NO POWER IS REQUIRED.
3. PART NUMBER FOR THIS UNIT IS 627-8137-001, SERIAL NUMBERS 001 & 002.



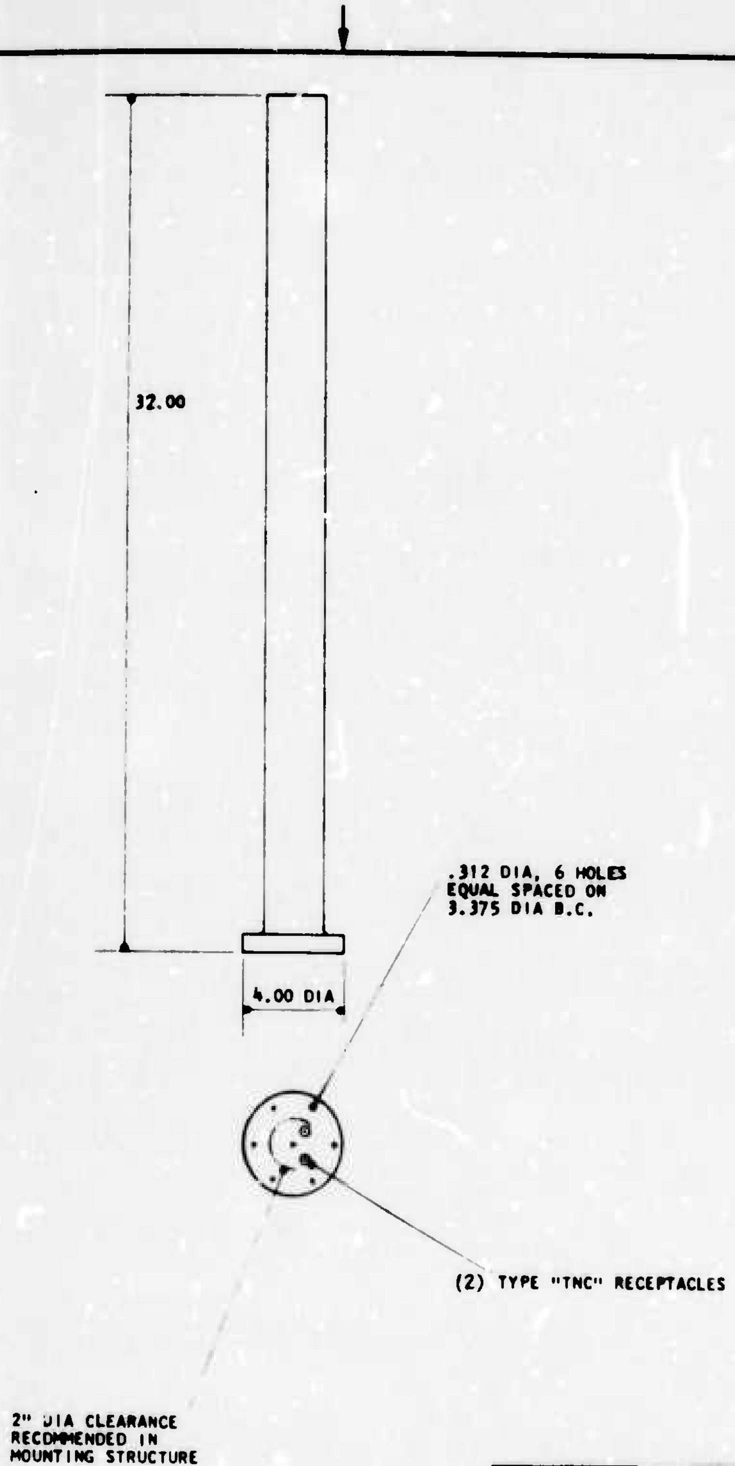
QTY	ITEM NO	PART OR IDENTIFYING NO
	DASH NO	

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
N/A	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP O. OELFEL
FINISH	HOLE DIAMETERS: UNDER .251 DIA = +.005-.005; .251 TO .500 DIA = +.006-.005; OVER .500 DIA = +.008-.005	CHK
N/A	ANGLES: ±1.0°	APVD
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	
	PART SHALL COMPLY TO 580-5400-001	

NEXT ASSY:

TYPE NO:

A



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

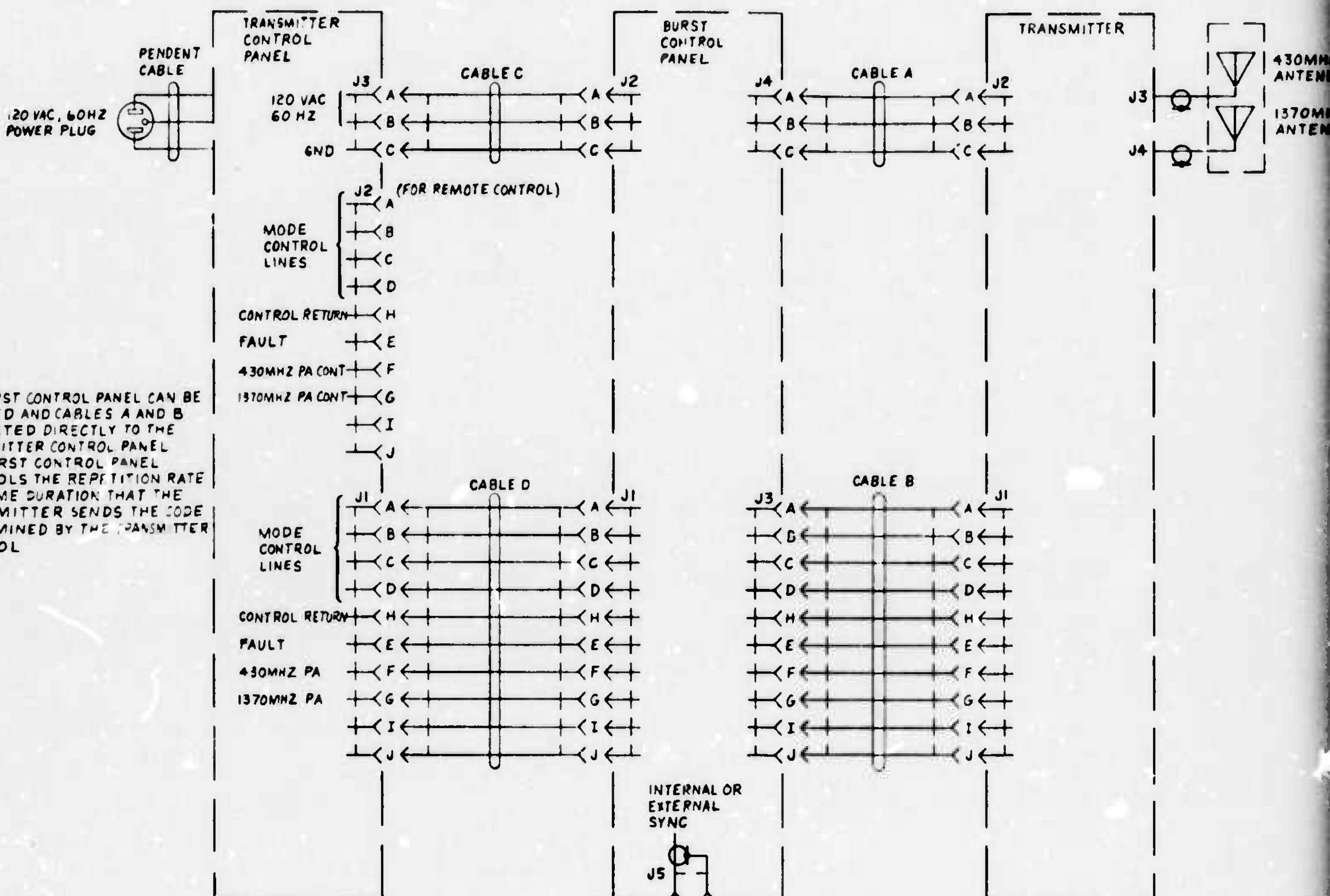
QTY	ITEM NO	PART OR IDENTIFYING NO	NAME	DESCRIPTION	UM	MN	ALTN PREF
	DASH NO	PARTS LIST					

MATERIAL N/A	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	CONTRACT NO. PREP D. DELFELD 11/20/73 CHK APVD R A. Hovick	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA ANTENNA OUTLINE & INSTALLATION PACKET RADIO TEST SET
FINISH N/A	PART SHALL COMPLY TO 580-5400-001		SIZE C / CODE IDENT 13499 / DWG NO 627-9582 SCALE 1/4 / SHEET

FRO ☐ NFP ☐ REL ☐ REV__ TC__ CR 0 NB 0 DL 2 TO 0

B

NAME	DATE
REQ'D	
CHK	



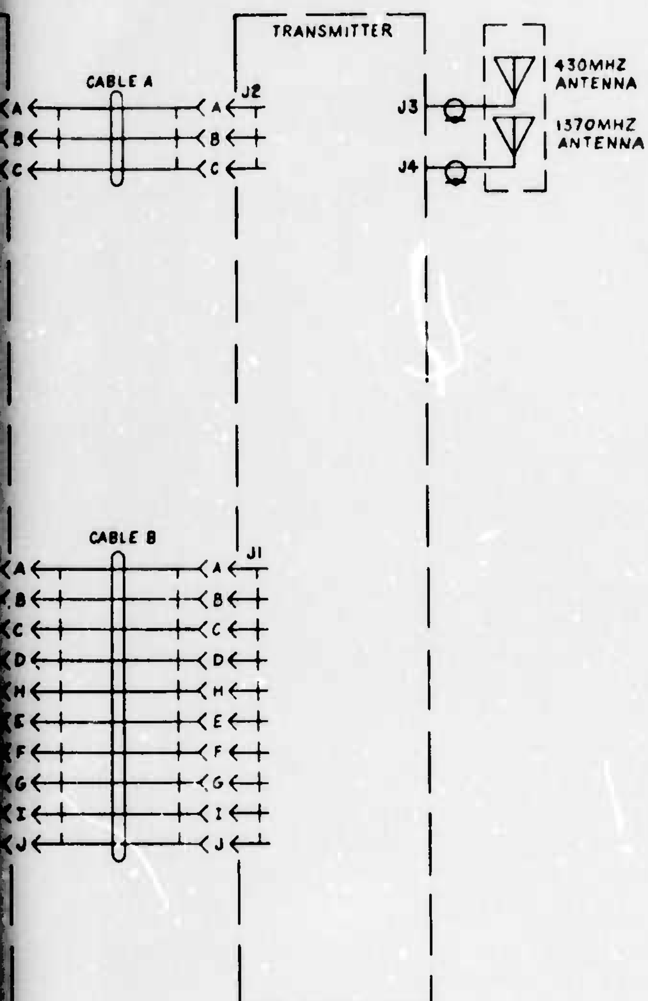
NOTES:
1. THE BURST CONTROL PANEL CAN BE OMITTED AND CABLES A AND B CONNECTED DIRECTLY TO THE TRANSMITTER CONTROL PANEL
2. THE BURST CONTROL PANEL CONTROLS THE REPETITION RATE AND TIME DURATION THAT THE TRANSMITTER SENDS THE CODE DETERMINED BY THE TRANSMITTER CONTROL

-001

NOTES

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVAL



PUBLICATIONS DRAWING
REVISIONS TO BE APPROVED AND MADE BY PUBLICATIONS ILLUSTRATING DEPARTMENT

PUB DWG NO				
SIZE	GUIDE & PEN	LINE WT	FINAL SIZE	%

CONTRACT NO

	NAME	DATE
DR	[illegible]	3/29/[illegible]
CHK		
APPD		

COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA — DALLAS, TEXAS
NEWPORT BEACH, CALIF — TORONTO, ONTARIO

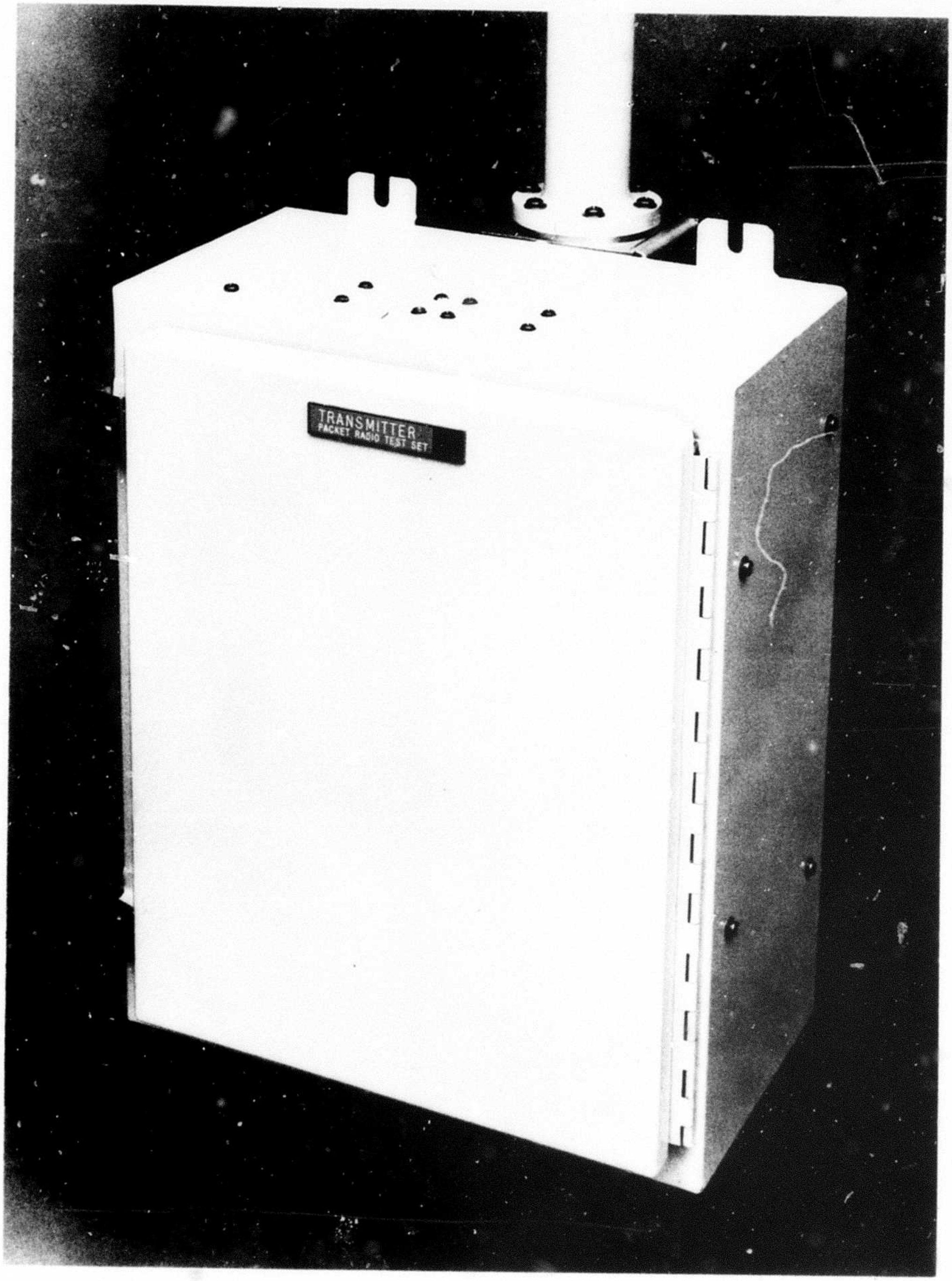
CABLING DIAGRAM
TRANSMITTER SYSTEM

SIZE	CODE IDENT NO	DWG NO
D		63-9567

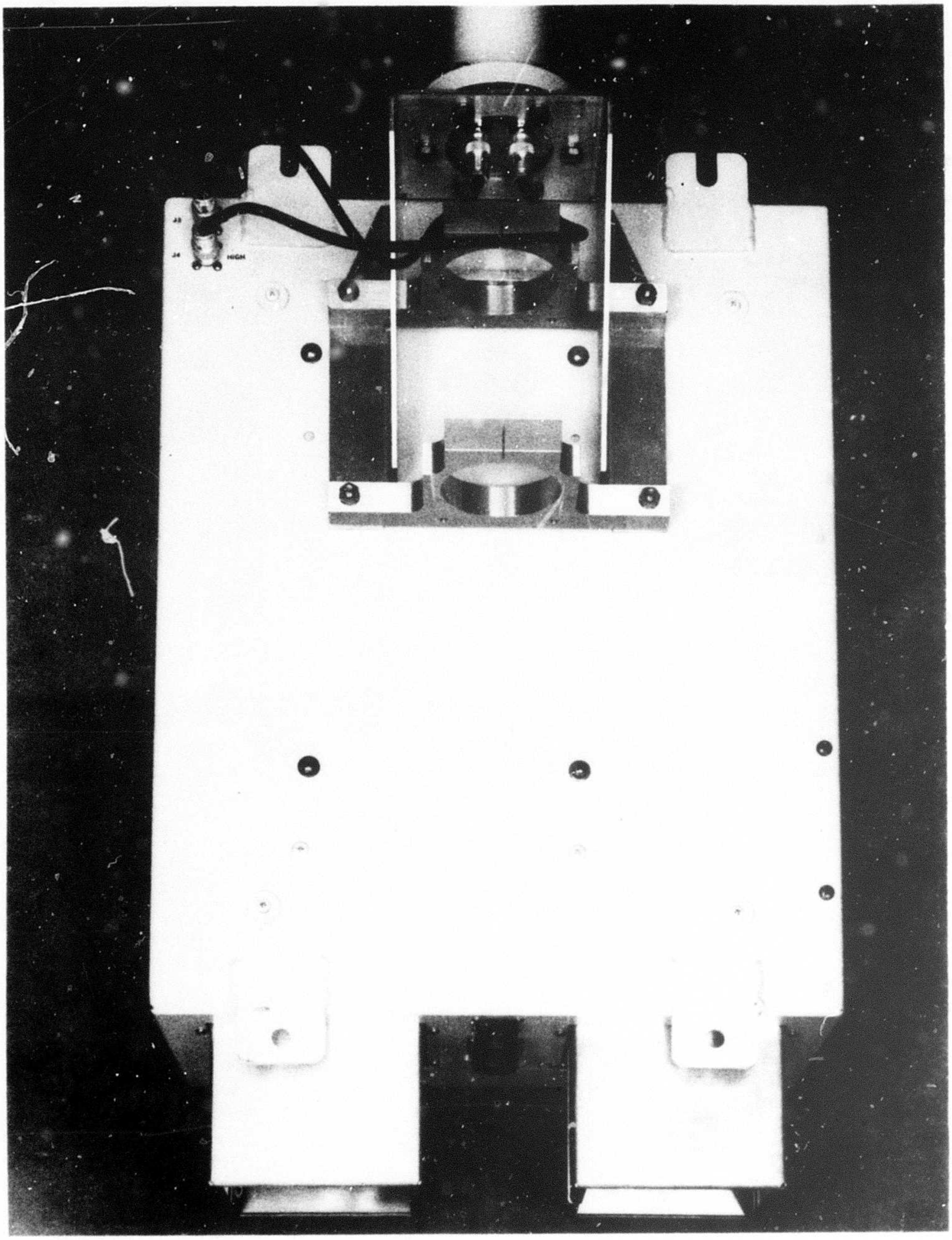
SCALE — SHEET OF

DASH	NEXT ASSY	EQUIP
APPLICATION		

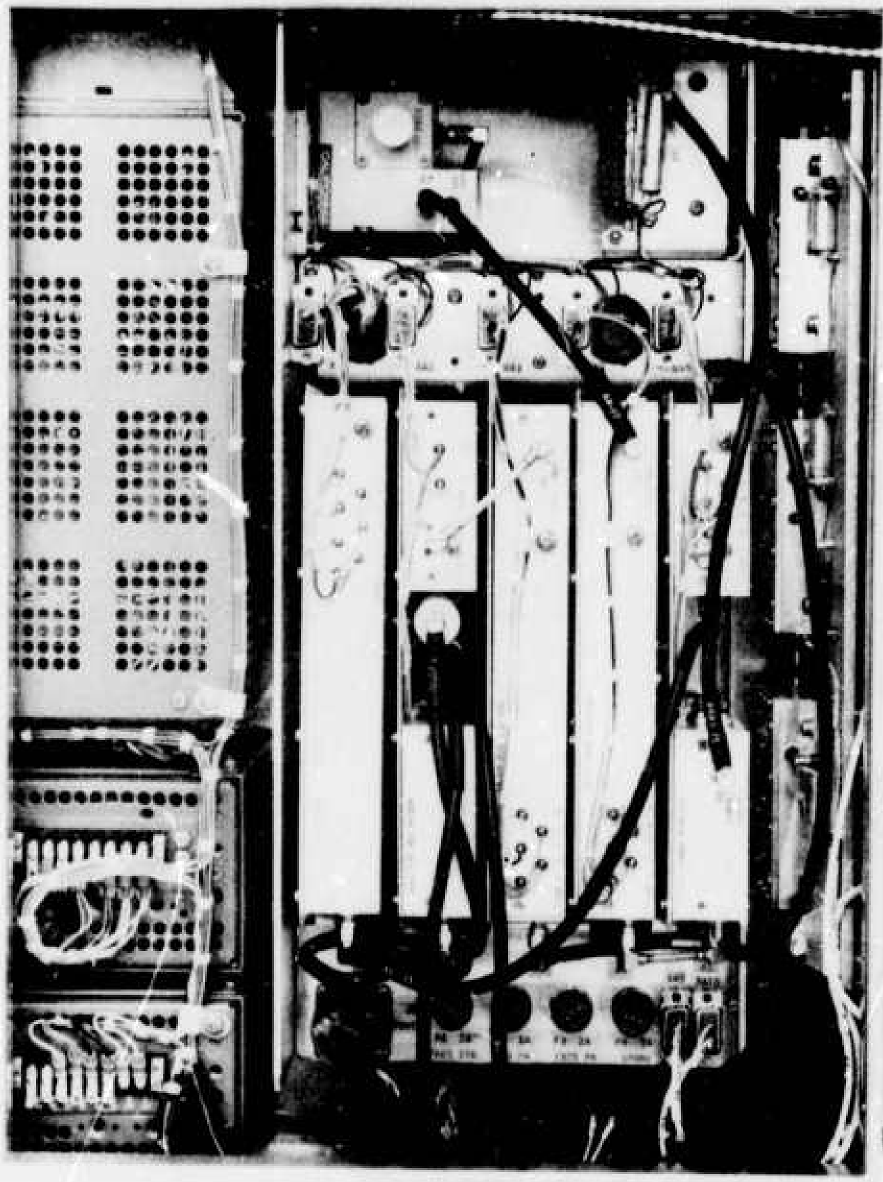
B



Front View

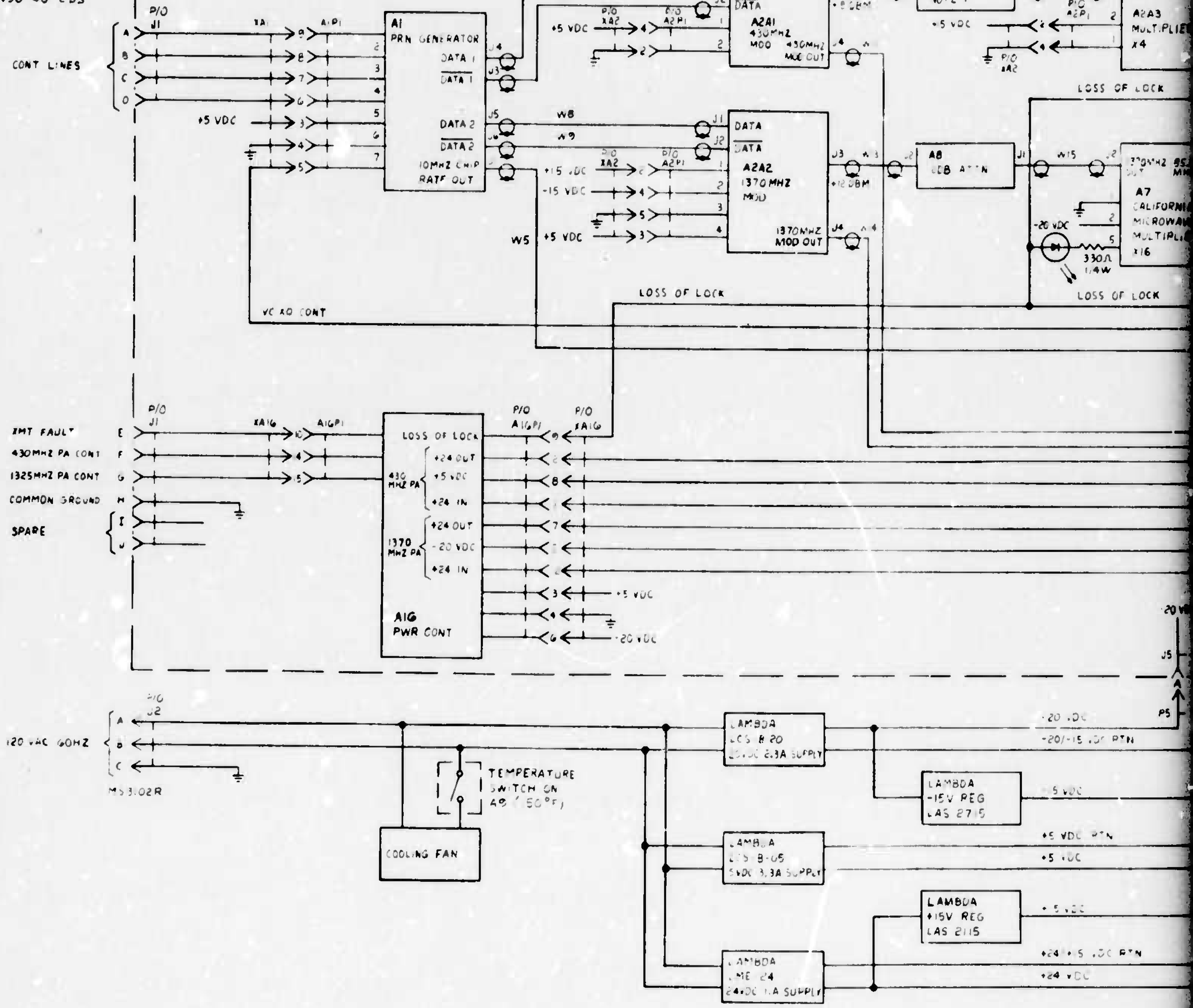


Rear View



Internal

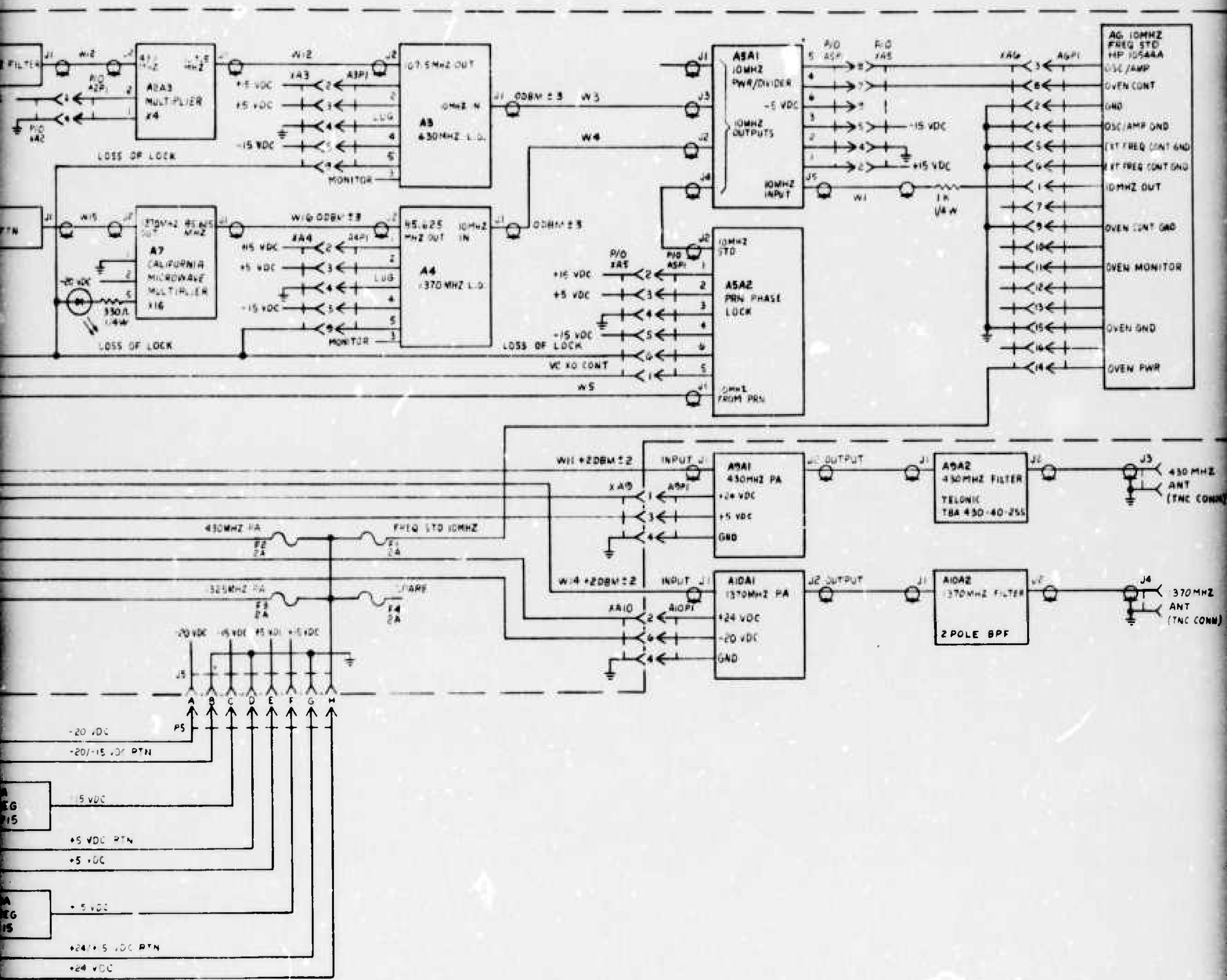
NOTES:
1. A2A4
430MHZ CTR FREQ
40MHZ BW
2 POLE FILTER
TBA 430-40-2SS



PART NUMBER	FRAME
627-9588	2/2

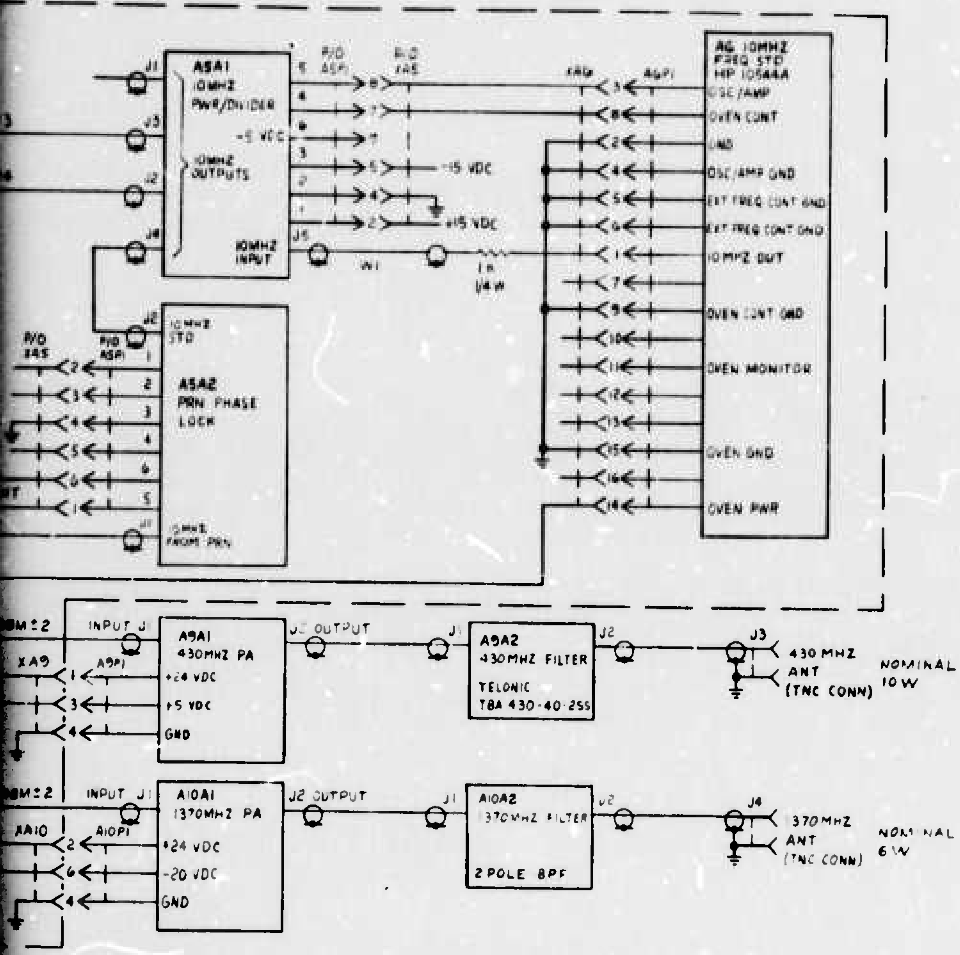
A

PART NUMBER	FRAME
627-9588	1/2



PART NUMBER	FRAME
627-9588	1/2

B



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

-001

REV B CHNG 1325 TO 1370MHZ 3-27-74
REV A FD CHNG 1-25-74

CONTRACT NO.	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA
PREP E W Kingle? 11-8-73	BLOCK DIAGRAM XMTR PACKET RADIO TEST SET
CHK	
APVD	SIZE D CODE IDENT 13499 DWG NO. 627-9588
	SCALE NONE SHEET

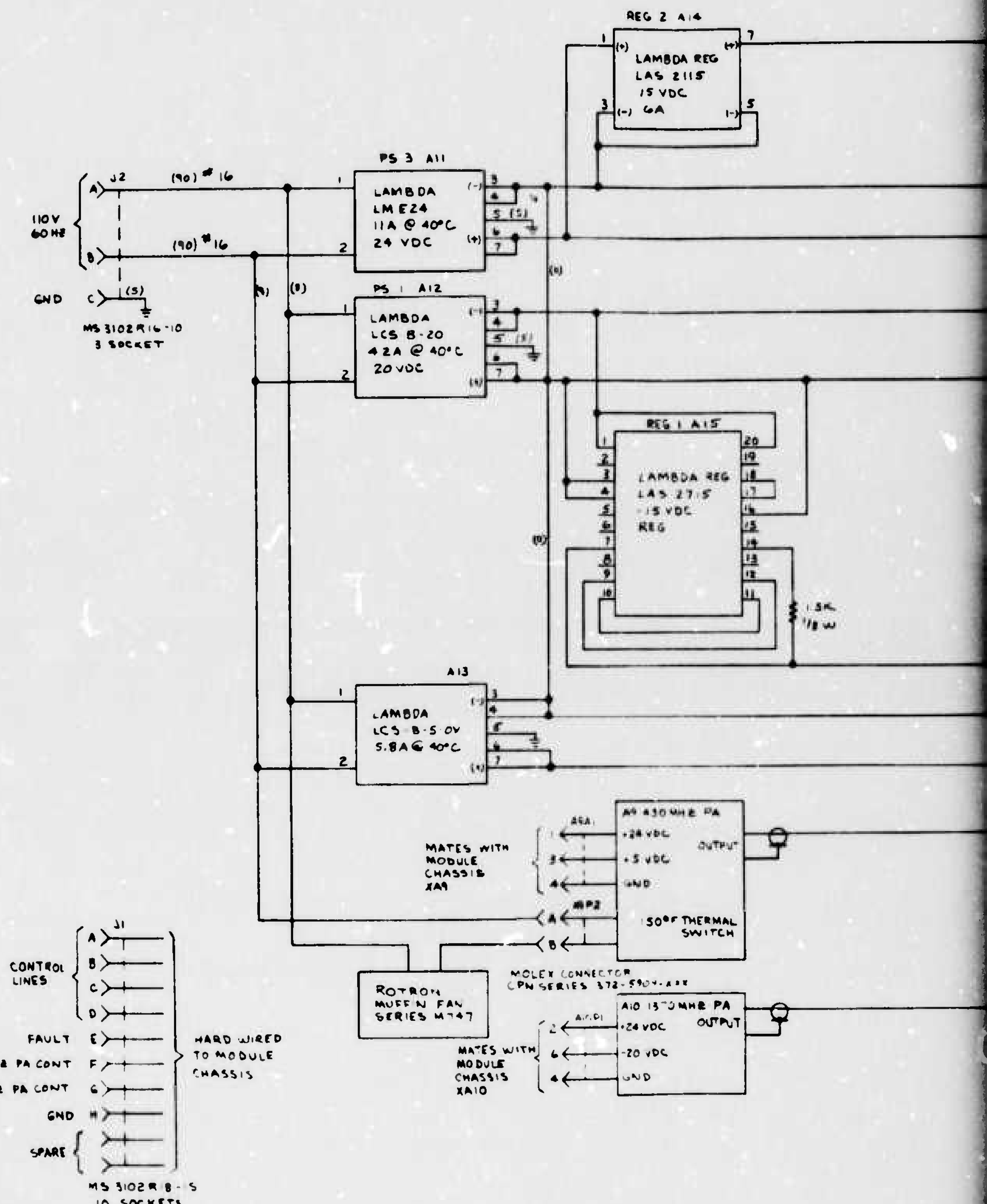
B

C

4A-97/4A-98

NOTES:

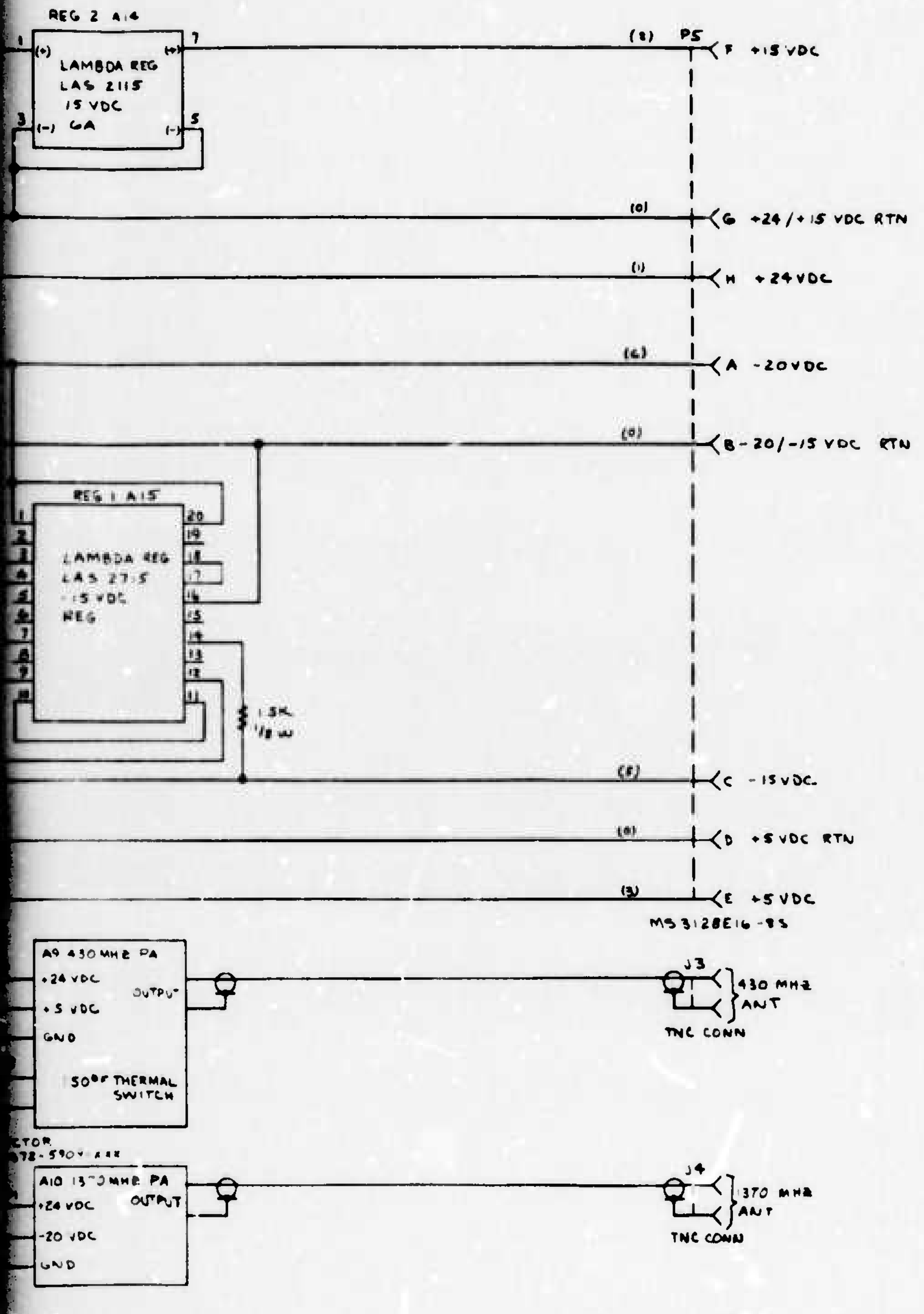
1. ALL WIRE #22 TEFLON UNLESS OTHERWISE NOTED. COLOR CODE IN ( )
2. A9P1 AND A10P1 ARE CINCH 9 PIN CONNECTORS
3. MS 3102R SERIES CONNECTORS MATES WITH MS 3106 SERIES PLUGS.



PART NUMBER	FRAME
627-9583	1/4

A

REVISIONS				
	LTR	DESCRIPTION	DATE	APPROVED



-001

PUBLICATIONS DRAWING
REVISIONS TO BE APPROVED AND MADE BY PUBLICATIONS ILLUSTRATING DEPARTMENT

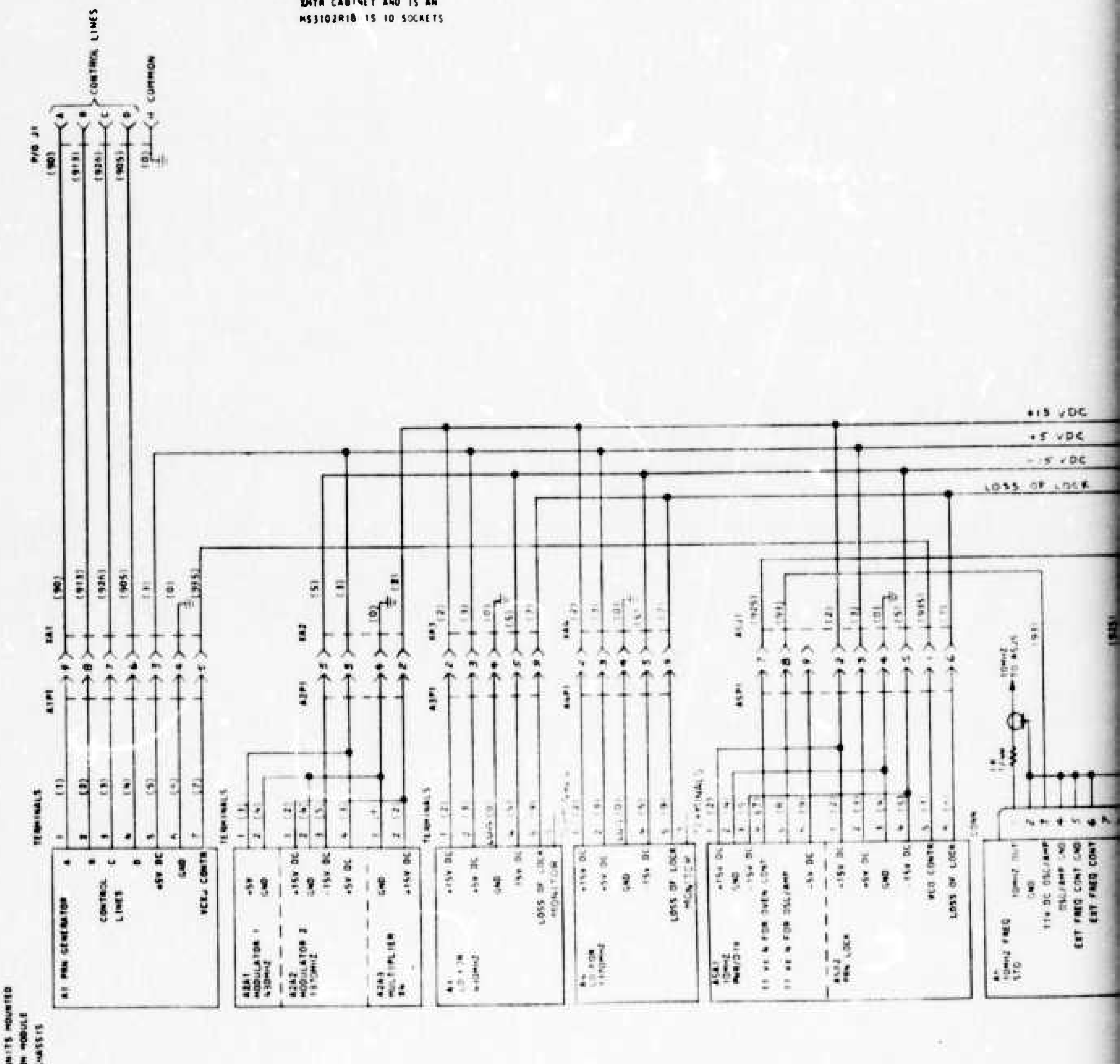
REV A CHNG 1325 TO 1370MHZ 3-27-74

CONTRACT NO	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
PREP 11-21-73	WIRING DIAGRAM ENCLOSURE PACKET RADIO TEST XMTR
CHK	SIZE D CODE IDENT 13499 DWG NO 527-5539
APVD	SCALE NONE SHEET

B

NOTES

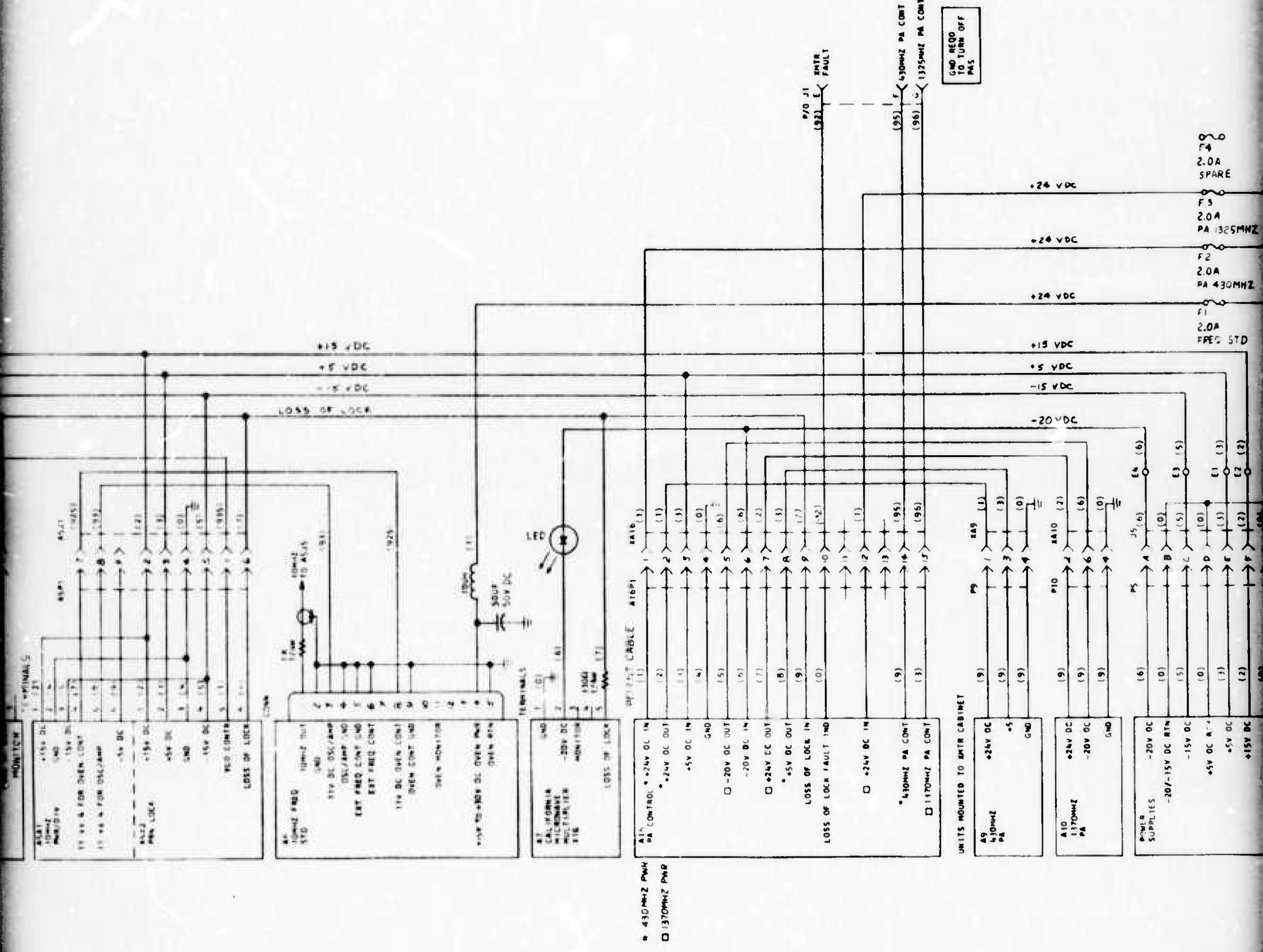
1. UNLESS OTHERWISE NOTED ALL CHASSIS WIRE NO 22 TEFLON WITH COLOR CODE NOTED IN ( )
2. CONNECTOR J1 MOUNTS TO XMTR CABINET AND IS AN MS3102R18 1S 10 SOCKETS



PART NUMBER	FRAME
627-9598	4 4

PART NUMBER	FRAME
627-9598	1/4

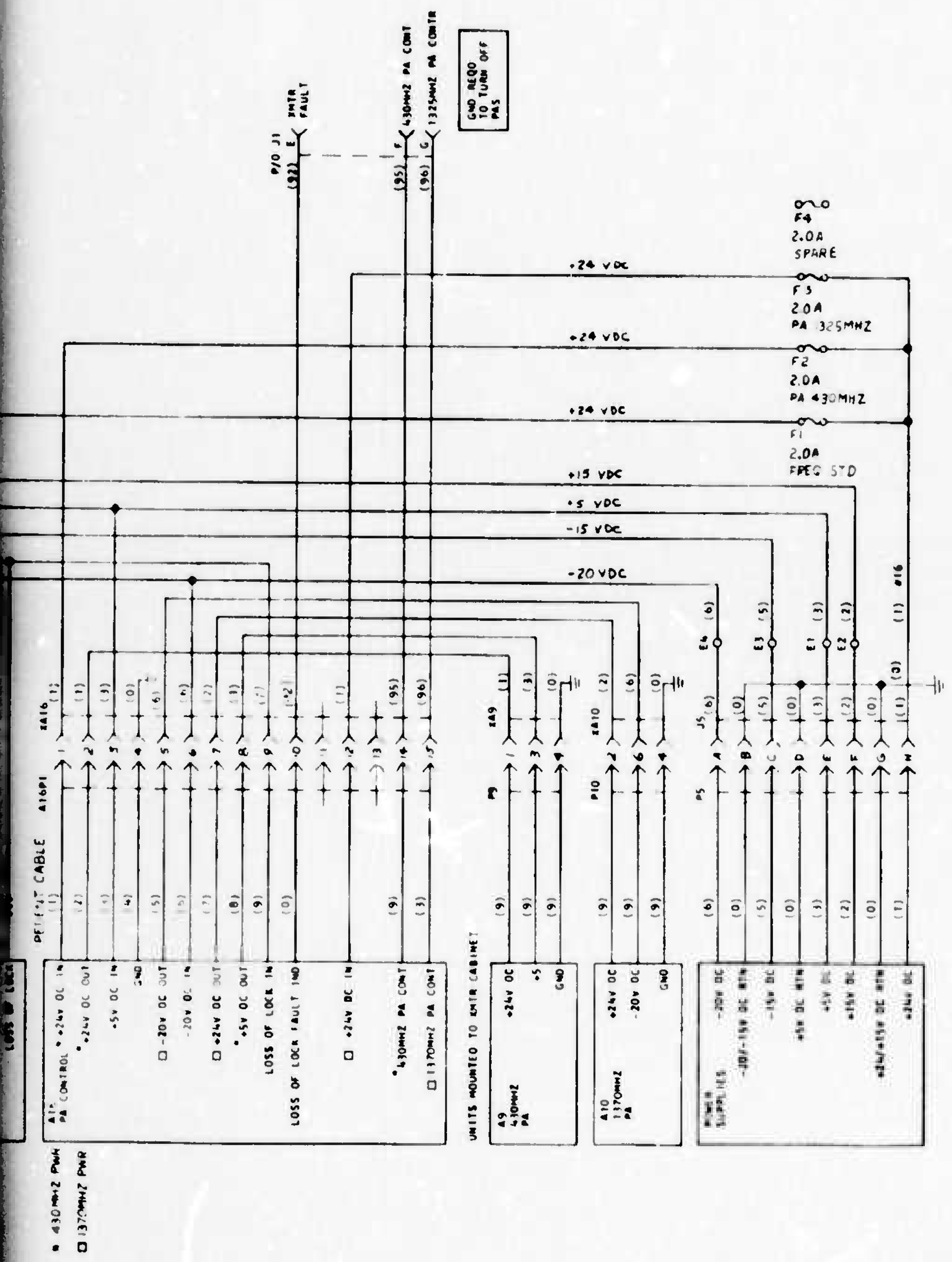
A



PART NUMBER	FRAME
127-3583	1/4

B

REVISIONS				
	LTR	DESCRIPTION	DATE	APPROVED



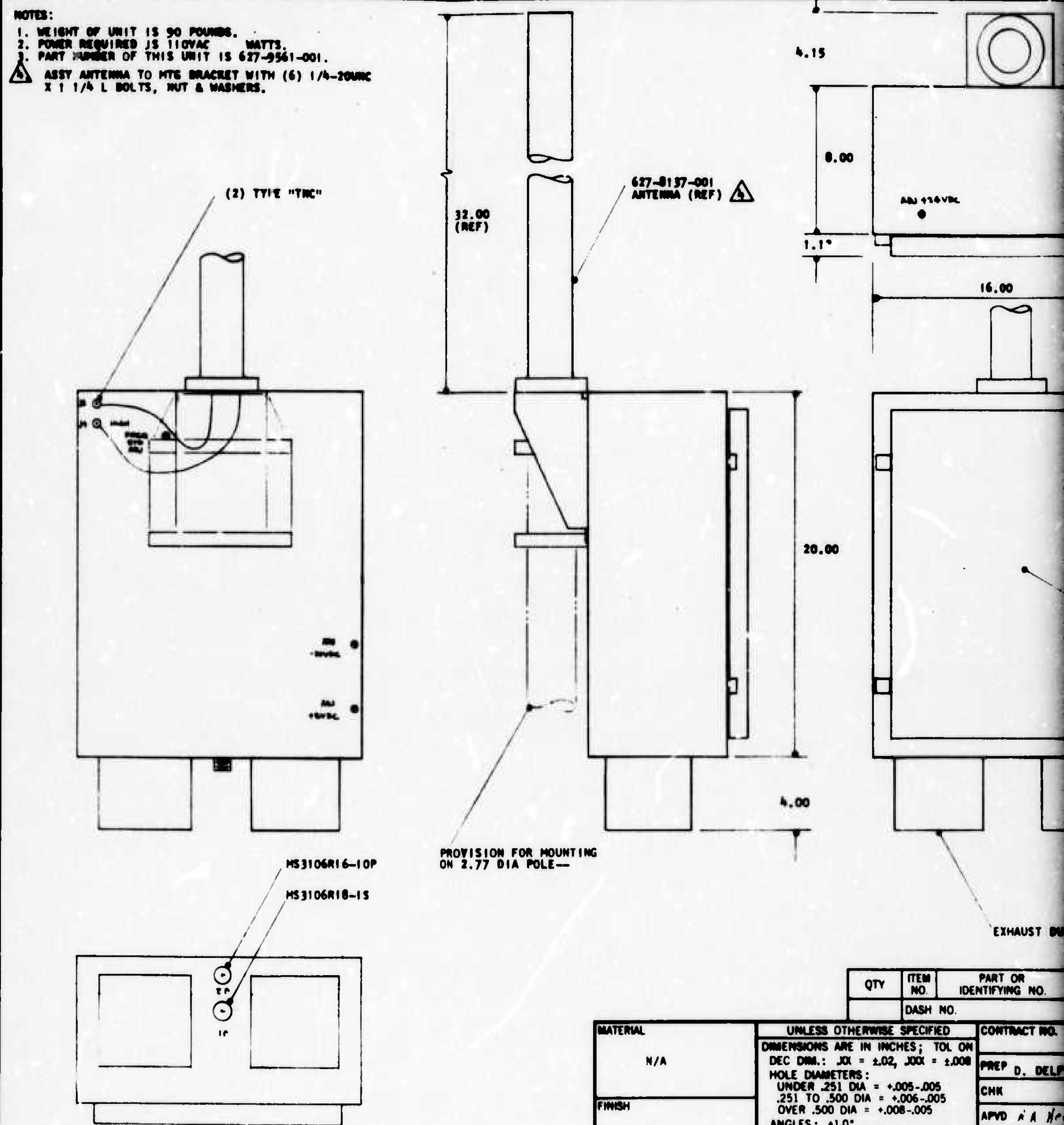
REV A CHNG 1325 TO 1370MHZ 3-27-74

CONTRACT NO	COLLINS RADIO COMPANY		
PREP E.W. Klingbeil	WIRING DIAGRAM MOBILE CHASSIS PACKET RADIO TEST		
CHK			
APVD	SIZE D	CODE IDENT 13499	DWG NO
	SCALE NONE		SHEET

PUBLICATIONS DRAWING

C

NOTES:
1. WEIGHT OF UNIT IS 90 POUNDS.
2. POWER REQUIRED IS 110VAC WATTS.
3. PART NUMBER OF THIS UNIT IS 627-9561-001.
4. ASSY ANTENNA TO MTG BRACKET WITH (6) 1/4-20UNC X 1 1/4 L BOLTS, NUT & WASHERS.



QTY	ITEM NO.	PART OR IDENTIFYING NO.
	DASH NO.	

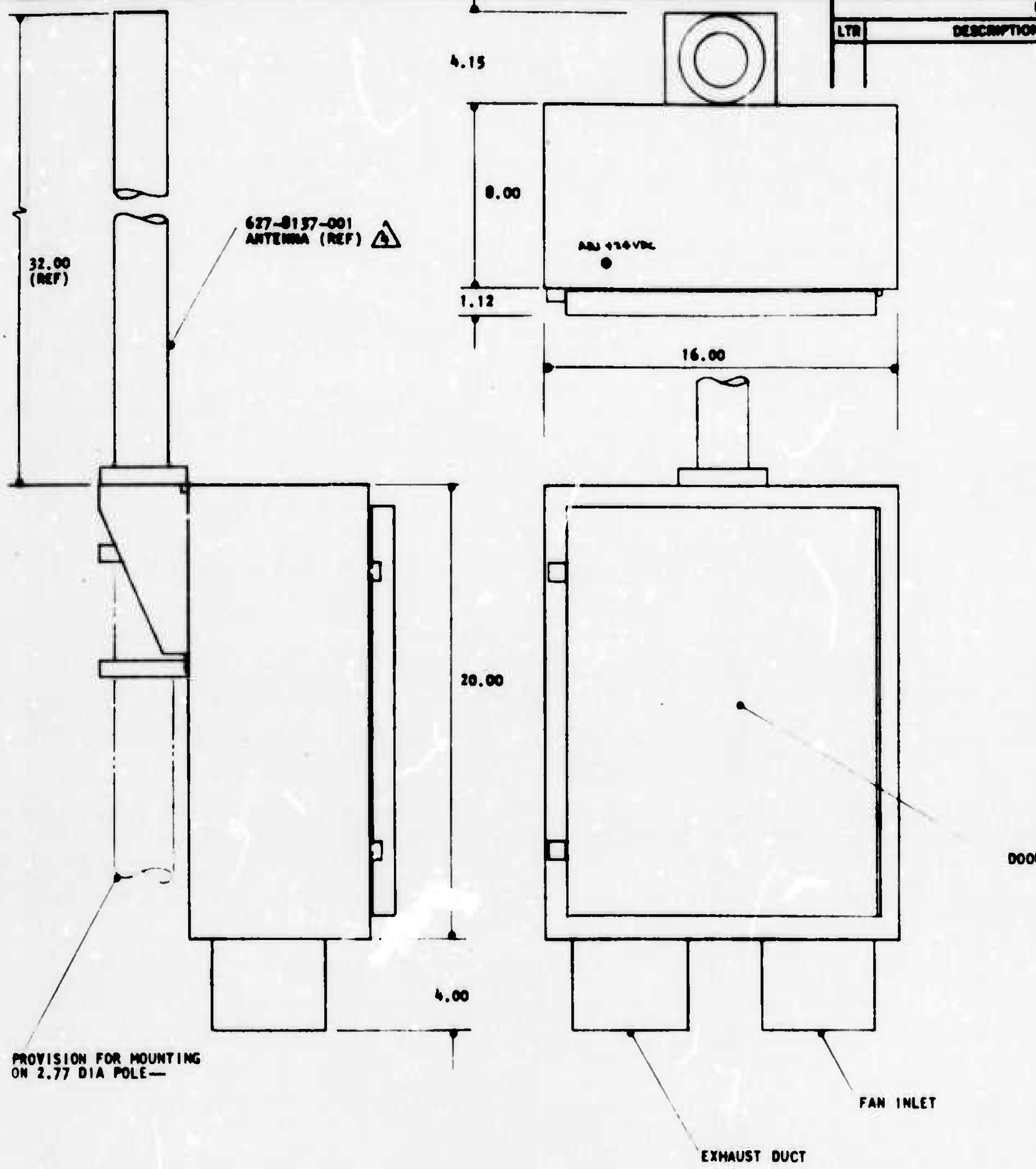
MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
N/A	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	PREP D. DELP CHK APVD
FINISH		
N/A	PART SHALL COMPLY TO 580-5400-001	

NEXT ASSY:

TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



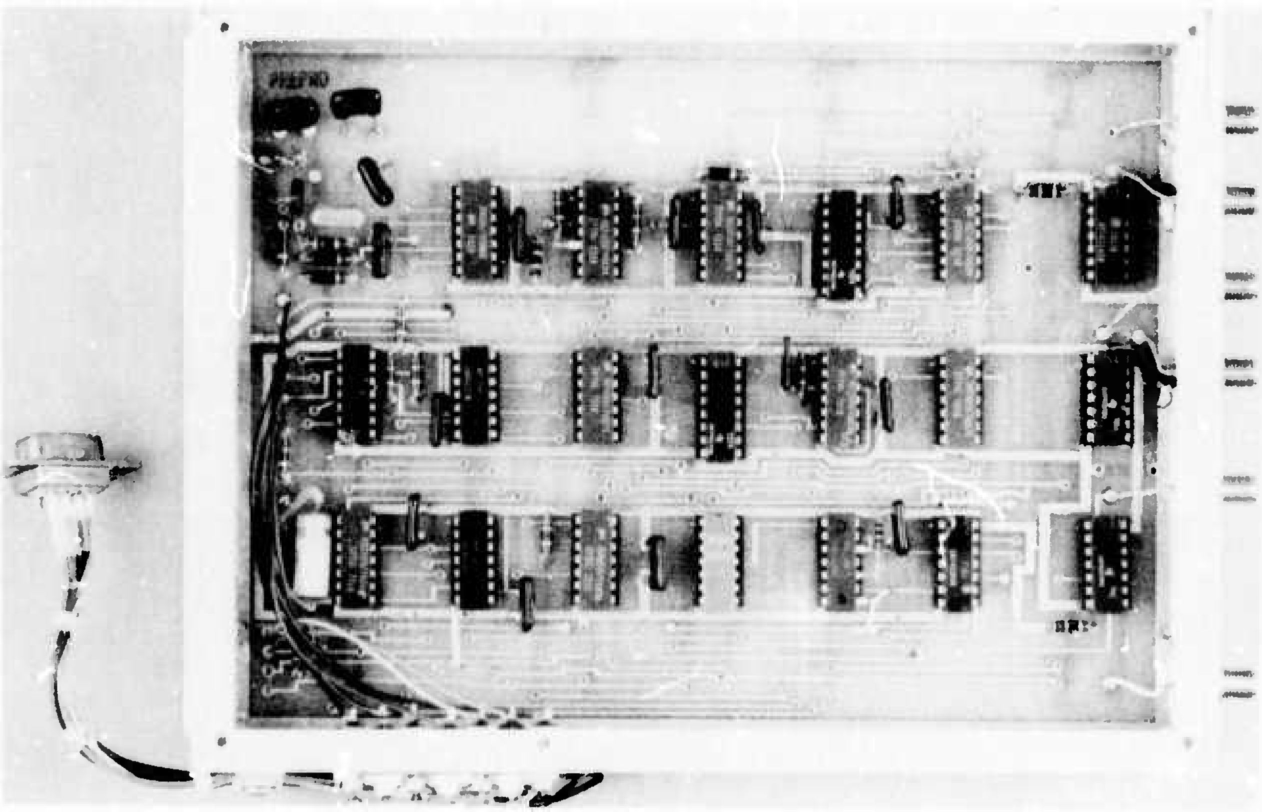
QTY	ITEM NO.	PART OR IDENTIFYING NO	NAME	DESCRIPTION	UM	MN	ALTN PREF
	DASH NO.	PARTS LIST					

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.	COLLINS RADIO COMPANY
N/A	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP D. DELFELD 11/20/73	DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA
	HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005	CHK	TRANSMITTER UNIT OUTLINE & INSTALLATION PACKET RADIO TEST SET
FINISH	ANGLES: ±1.0°	APVD R A H[illegible]	SIZE C CODE IDENT 13499 DWG NO. 627-9578
N/A	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE 1/4 SHEET
	PART SHALL COMPLY TO 580-5400-001		

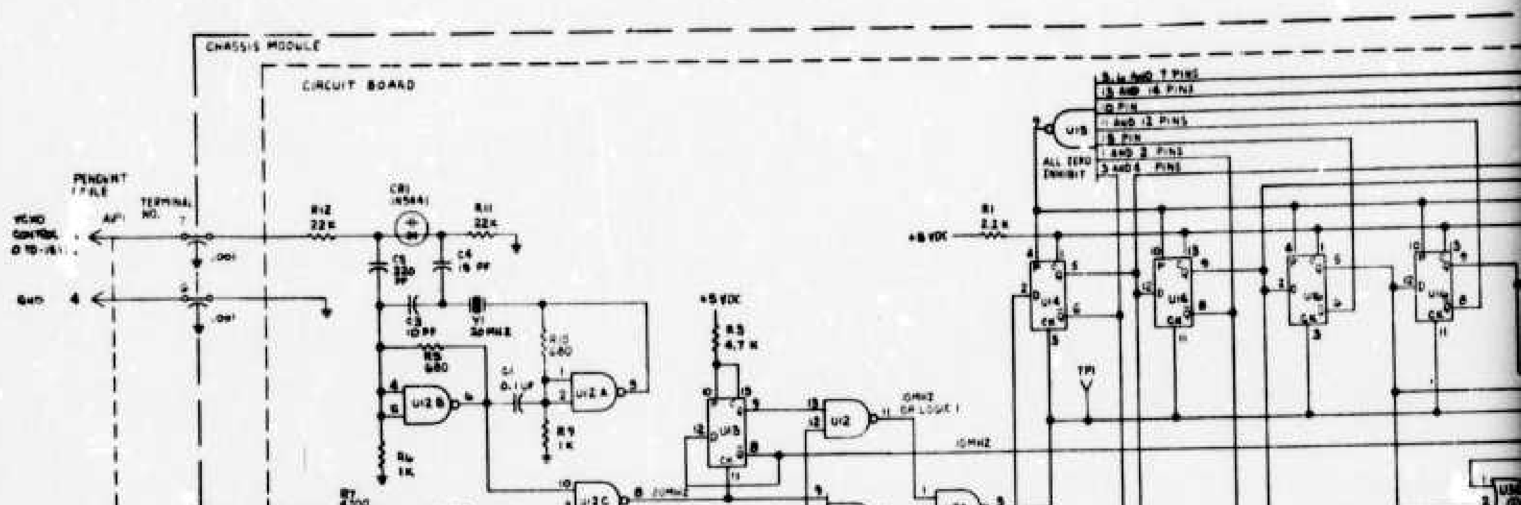
FRO ☐ NFP ☐ REL ☐ REV_ _ TC_ _ CR 0 NB 0 DL 2 TO 0

B

4A-103/4A-104

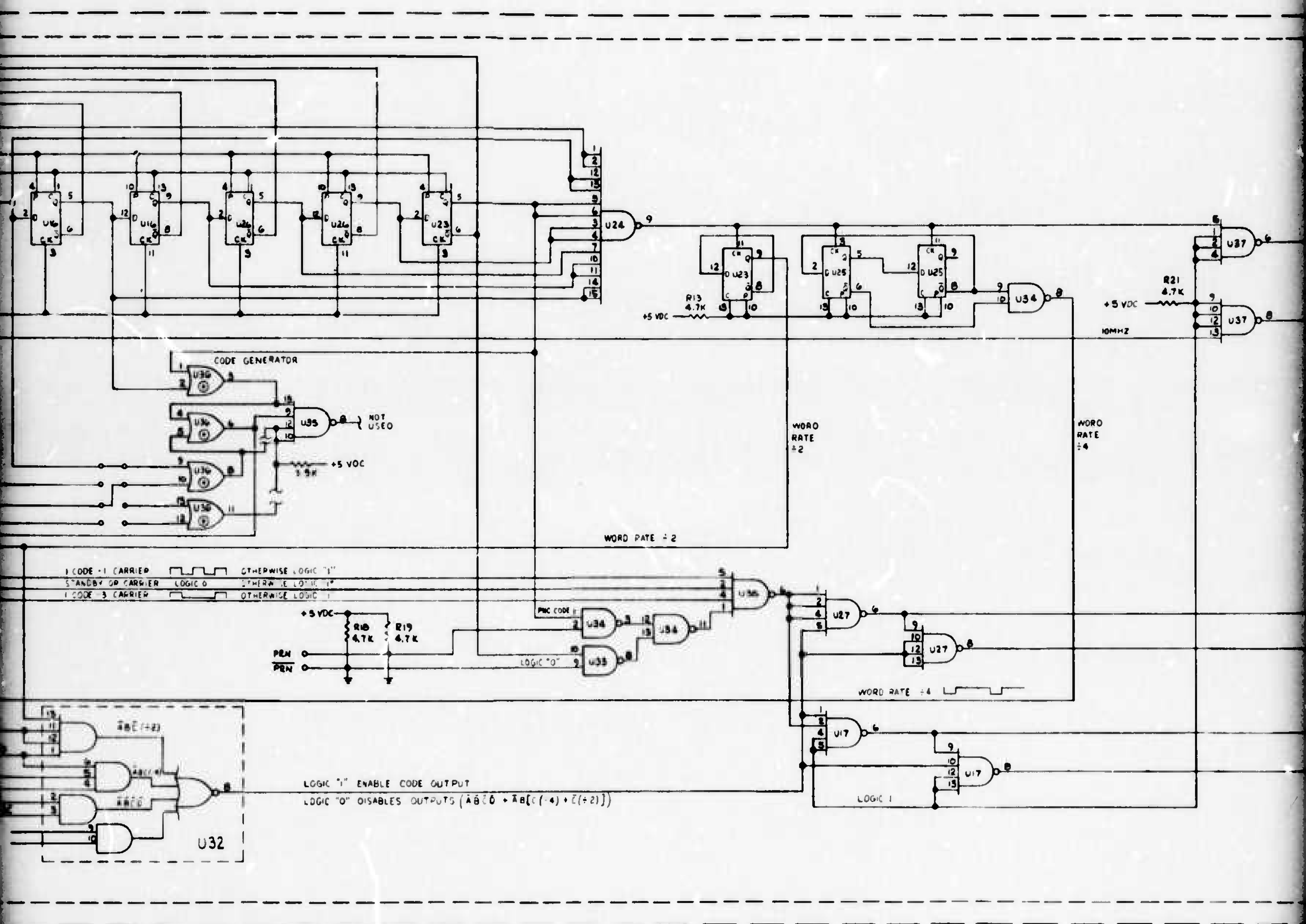


A1 - PRN Code Generator


CHASSIS MODULE
CIRCUIT BOARD
PENDANT CABLE
TERMINAL NO.
GND
CONTROL LINES
ALL ZERO INHIBIT
10MHZ
20MHZ
EXT CLOCK
WORD RATE 12
WORD RATE 14
CODE 1 CARRIER
STANDBY OR CARRIER
CODE 5 CARRIER
+5 VDC
0.1 UF DIP MICA ASSOCIATED WITH AN INTEGRATED CKT

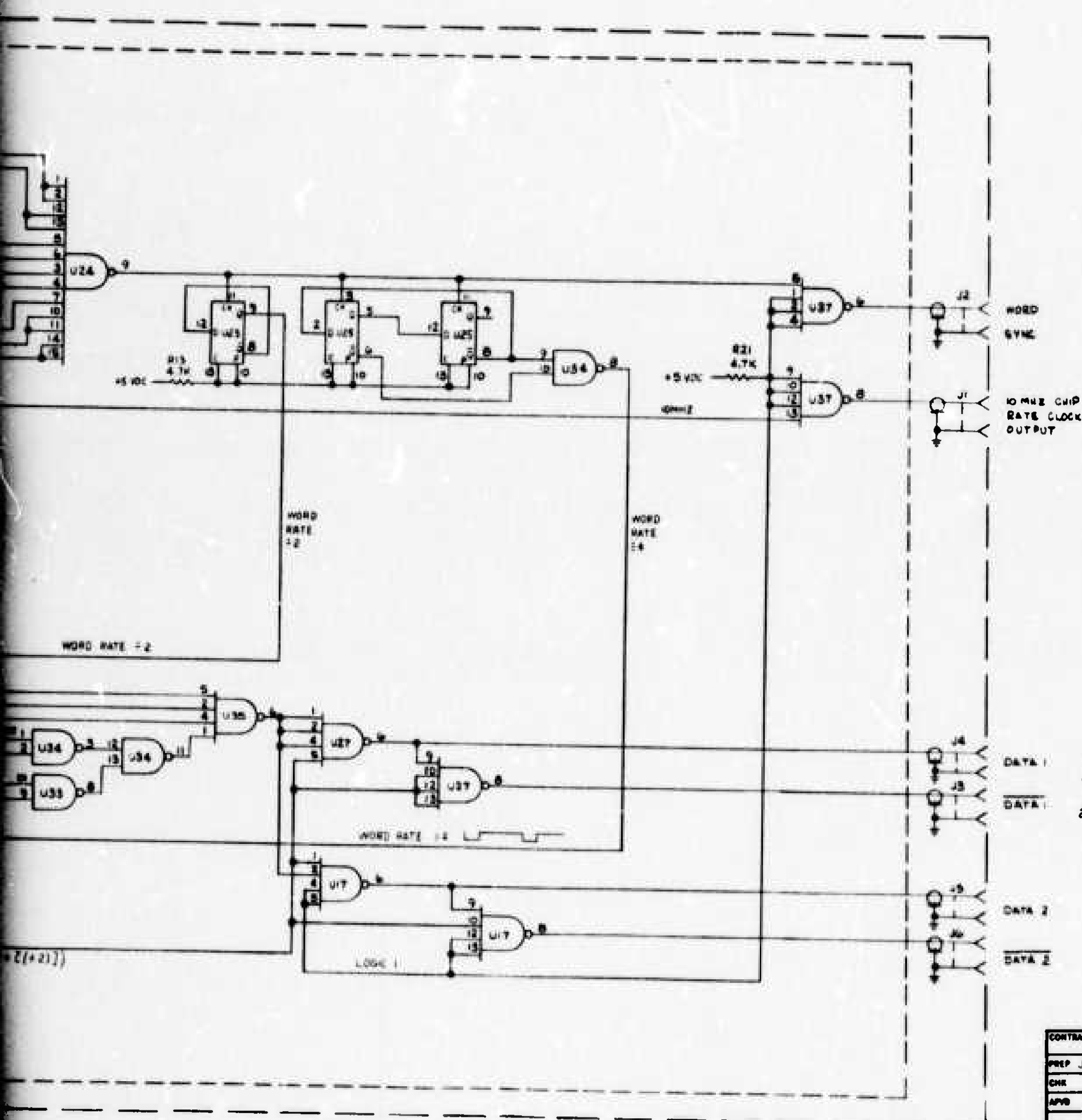
627-9601 2/4

A



PART NUMBER 627-9601 FRAME 1/4

" B



REVISIONS			
LTR	DESCRIPTION	DATE	APPROV.

OUTPUTS
1. DATA AND $\overline{\text{DATA}}$ BOTH LOGIC 1 WHEN CODE AND CARRIER DISABLED
2. FOR CARRIER
   DATA LOGIC 0
   $\overline{\text{DATA}}$ LOGIC 1

-001

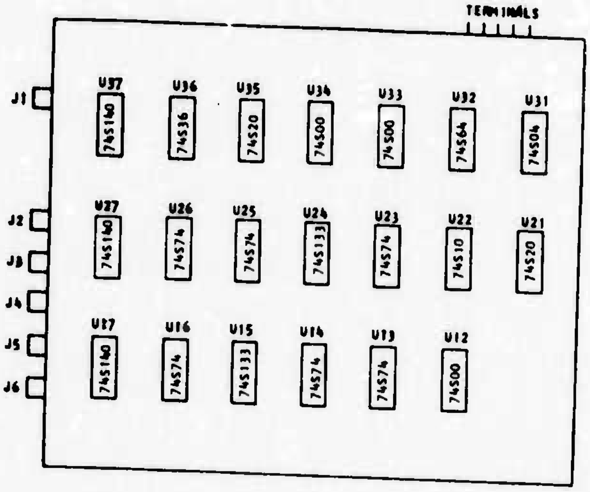
REV A FO CHNG 1-25-74

CONTRACT NO	COLLINS RADIO COMPANY DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA
PREP J MUCLEY	SCHEMATIC DIAGRAM A1 FRN GENERATOR PACKET RADIO TEST UNIT
CHK	SIZE D · CODE IDENT 13499 · DWG NO. 627-9601
APVD	SCALE · SHEET 1 OF 2

C

NOTES:

1. IC LOCATION C



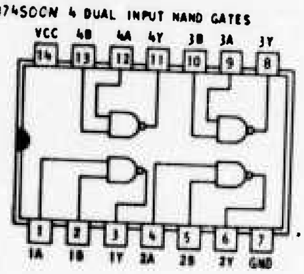
2. CONTROL LINE TRUTH TABLE

CONTROL LINES				OPERATION DESCRIPTION
A	B	C	D	
0	0	0	0	STANDBY
0	0	0	1	CW
0	0	1	0	CONT CODE AT 10 MCPS
0	0	1	1	CONT CODE AT 20 MCPS
0	1	0	0	1 CODE - 1 CARRIER OFF AT 10 MCPS
0	1	0	1	1 CODE - 1 CARRIER OFF AT 20 MCPS
0	1	1	0	1 CODE - 3 CARRIER OFF AT 10 MCPS
0	1	1	1	1 CODE - 3 CARRIEF OFF AT 20 MCPS
1	0	0	0	1 CODE - 1 CARRIER AT 10 MCPS
1	0	0	1	1 CODE - 1 CARRIER AT 20 MCPS
1	0	1	0	1 CODE - 3 CARRIER AT 10 MCPS
1	0	1	1	1 CODE - 3 CARRIER AT 20 MCPS

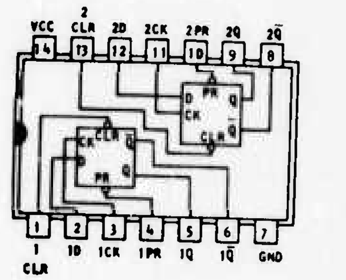
1 IS OPEN CKT (BECOMES TTL LOGIC "1")
0 IS GND (TTL LOGIC "0")

3. IC TYPE S (VCC +5V DC) TOP VIEWS

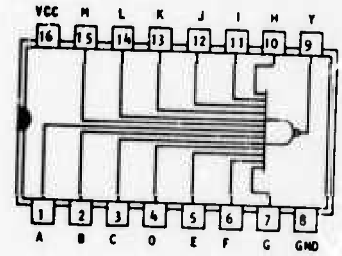
A. U12/U33/U34 TI SN74SOCN 4 DUAL INPUT NAND GATES



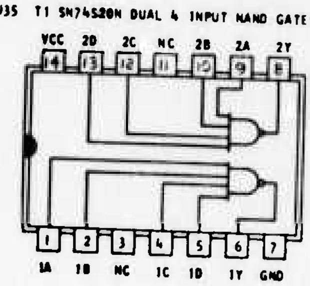
B. U13/U14/U16/U23/U25/U26 TI SN 74S74N DUAL "D" TYPE POSITIVE EDGE TRIGGERED FLIP FLOPS.



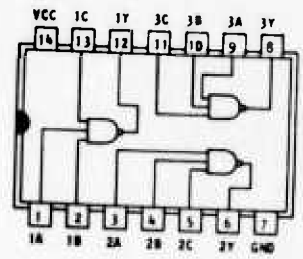
C. U15/U24 TI SN74S133N 13 INPUT NAND GATE



D. U21/U35 TI SN74S20N DUAL 4 INPUT NAND GATES



E. U22 TI SN74S10N 3 INPUT NAND GATES

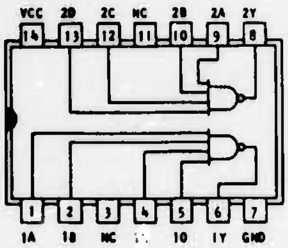


PART NUMBER	FRAME
627-9601	3/4

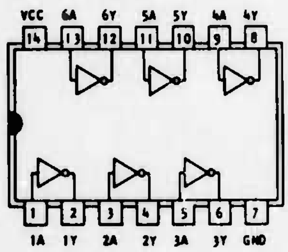
A

REVISIONS	
LTR	DESCRIPTION

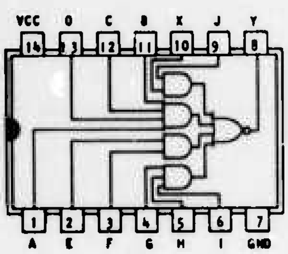
F. U17/U27/U37 TI SN74S140N DUAL 4 INPUT NAND 50 OHM LINE DRIVER.



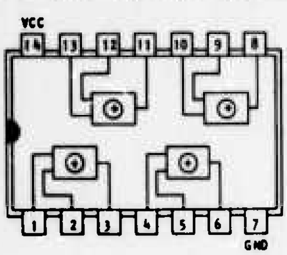
G. U31 TISN74S04 HEX INVERTERS



H. U32 TISN74S64N 4-2-3-2 INPUT AND OR INVERT GATES

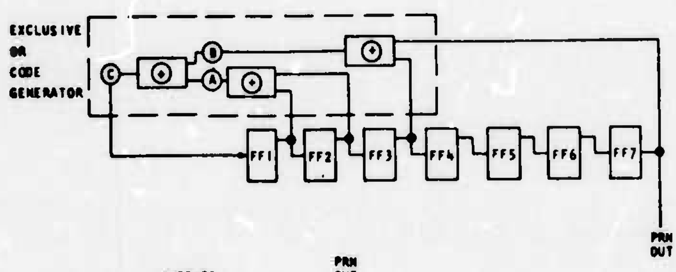


I. U36 NATIONAL SEMICONDUCTOR DM 74S86N 4 DUAL INPUT EXCLUSIVE OR GATES



4. DATA OUTPUT WORD (127 CHIPS)

1 1 1 1 1 1 1 0 1 1 1 0 1 1 0 1 1 1 1 0
1 0 0 0 1 0 1 1 0 0 1 0 1 1 1 1 1 0 0 0
1 0 0 0 0 0 0 1 1 0 0 1 1 0 1 1 0 0 0 1
1 1 0 0 1 1 1 0 1 0 1 1 1 0 0 0 0 1 0 0
1 1 0 0 0 0 0 1 0 1 0 1 0 1 1 0 1 0 0 1
0 0 1 0 1 0 0 1 1 1 1 0 0 1 0 0 0 1 1 0
1 0 1 0 0 0 0



CLOCK STEP	OUTPUTS FF 1	FF 2	FF 3	FF 4	FF 5	FF 6	PRN OUT FF 7	A	B	C
1	1	1	1	1	1	1	1	0	0	0
2	0	1	1	1	1	1	1	1	0	1
3	1	0	1	1	1	1	1	1	0	1
4	1	1	0	1	1	1	1	0	1	1
5	1	1	1	0	1	1	1	0	0	0
6	0	1	1	1	0	1	1	1	0	1
7	1	0	1	1	1	0	1	1	0	1
8	1	1	0	1	1	1	0	0	0	0
9	0	1	1	0	1	1	1	1	0	1
10	1	0	1	1	0	1	1			

ETC

5. UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROFARADS

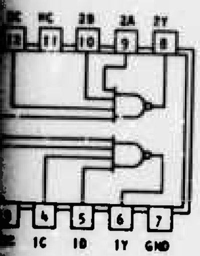
SIZE	CODE IDENT
D	13499
SCALE NONE	

B

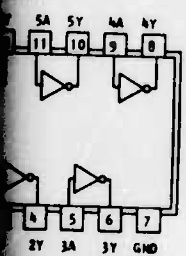
C

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

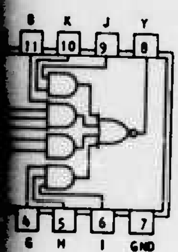
DUAL 4 INPUT NAND 50 OHM



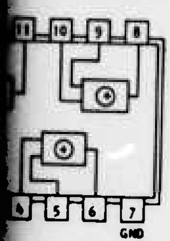
ERS



PUT AND OR INVERT GATES

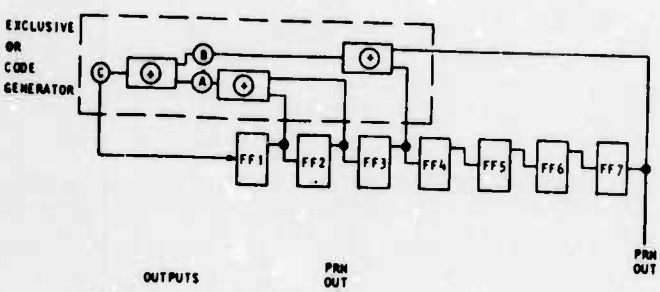


N 74S86N 4 DUAL INPUT EXCLUSIVE OR GATES



4. DATA OUTPUT WORD (127 CHIPS)

1 1 1 1 1 1 1 0 1 1 1 0 1 1 0 1 1 1 1 0
1 0 0 0 1 0 1 1 0 0 1 0 1 1 1 1 1 0 0 0
1 0 0 0 0 0 0 1 1 0 0 1 1 0 1 1 0 0 0 1
1 1 0 0 1 1 1 0 1 0 1 1 1 0 0 0 0 1 0 0
1 1 0 0 0 0 0 1 0 1 0 1 0 1 1 0 1 0 0 1
0 0 1 0 1 0 0 1 1 1 1 0 0 1 0 0 0 1 1 0
1 0 1 0 0 0 0



CLOCK STEP	OUTPUTS FF 1	FF 2	FF 3	FF 4	FF 5	FF 6	PRN OUT FF 7	A	B	C
1	1	1	1	1	1	1	1	0	0	0
2	0	1	1	1	1	1	1	1	0	1
3	1	0	1	1	1	1	1	1	0	1
4	1	1	0	1	1	1	1	0	1	1
5	1	1	1	0	1	1	1	0	0	0
6	0	1	1	1	0	1	1	1	0	1
7	1	0	1	1	1	0	1	1	0	1
8	1	1	0	1	1	1	0	0	0	0
9	0	1	1	0	1	1	1	1	0	1
10	1	0	1	1	0	1	1			

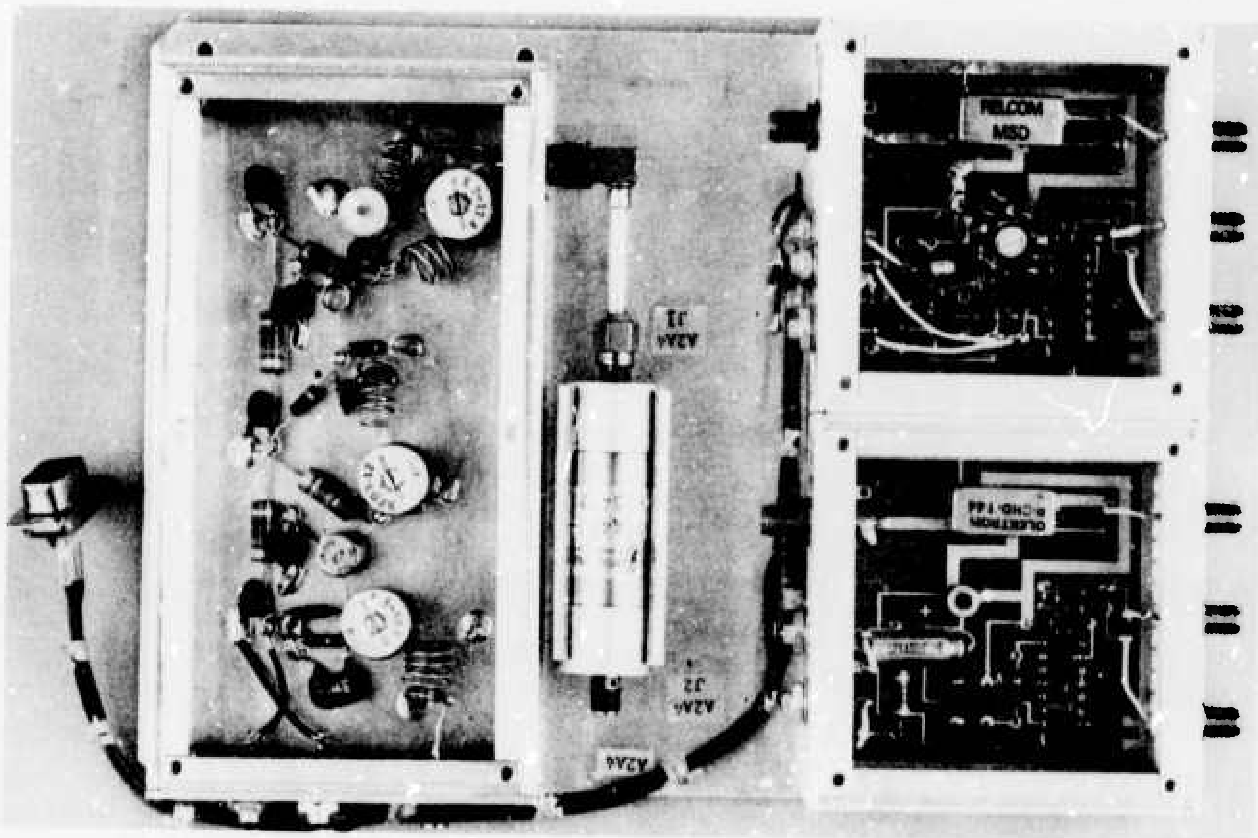
ETC

5. UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROFARADS

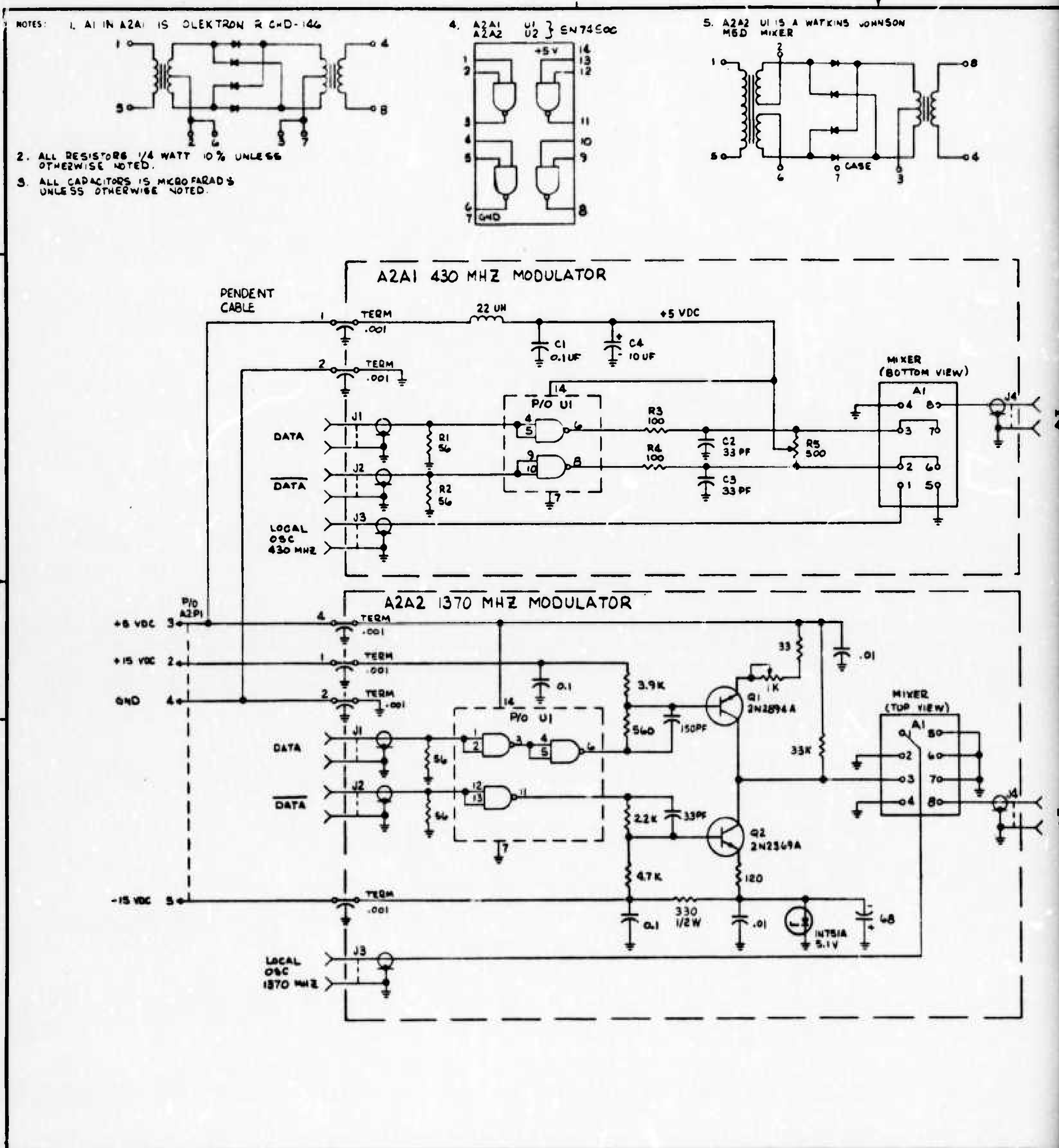
B

SIZE D M	CODE IDENT 13499	DWG NO. 627-9601
SCALE NONE		SHEET 2 OF 2

C



A2( )

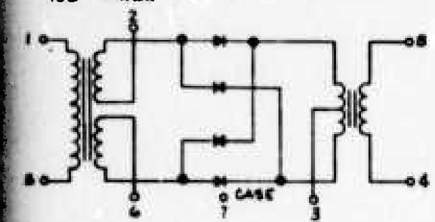


NEXT ASSY:

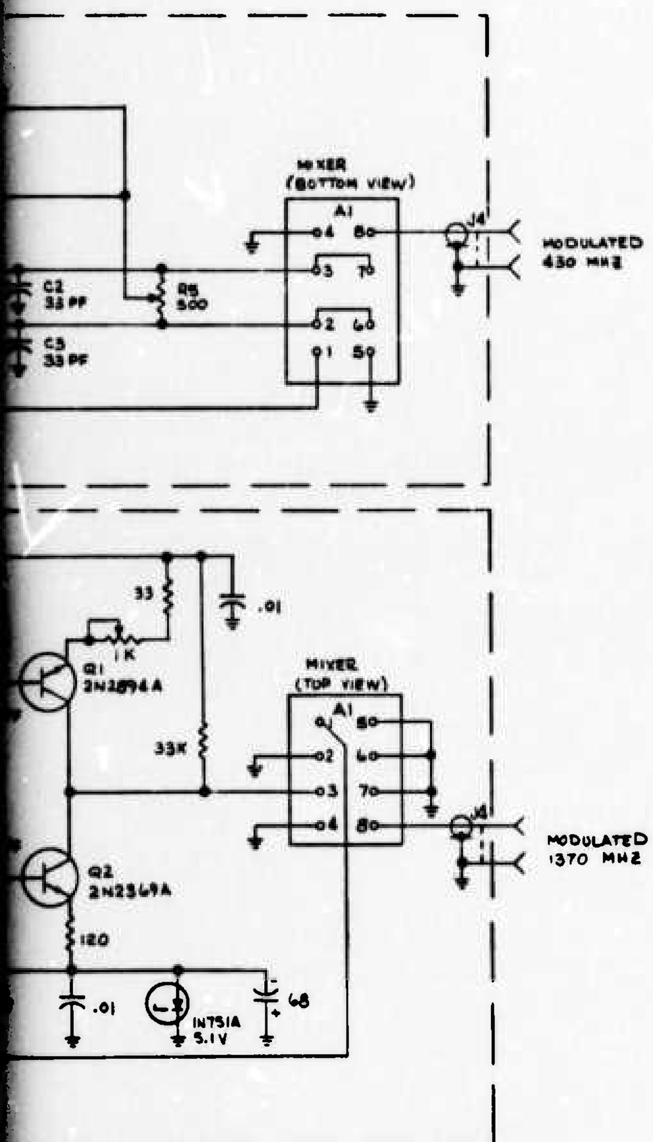
TYPE NO:

A

5. A2A2 U1 IS A WATKINS JOHNSON M8D MIXER



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



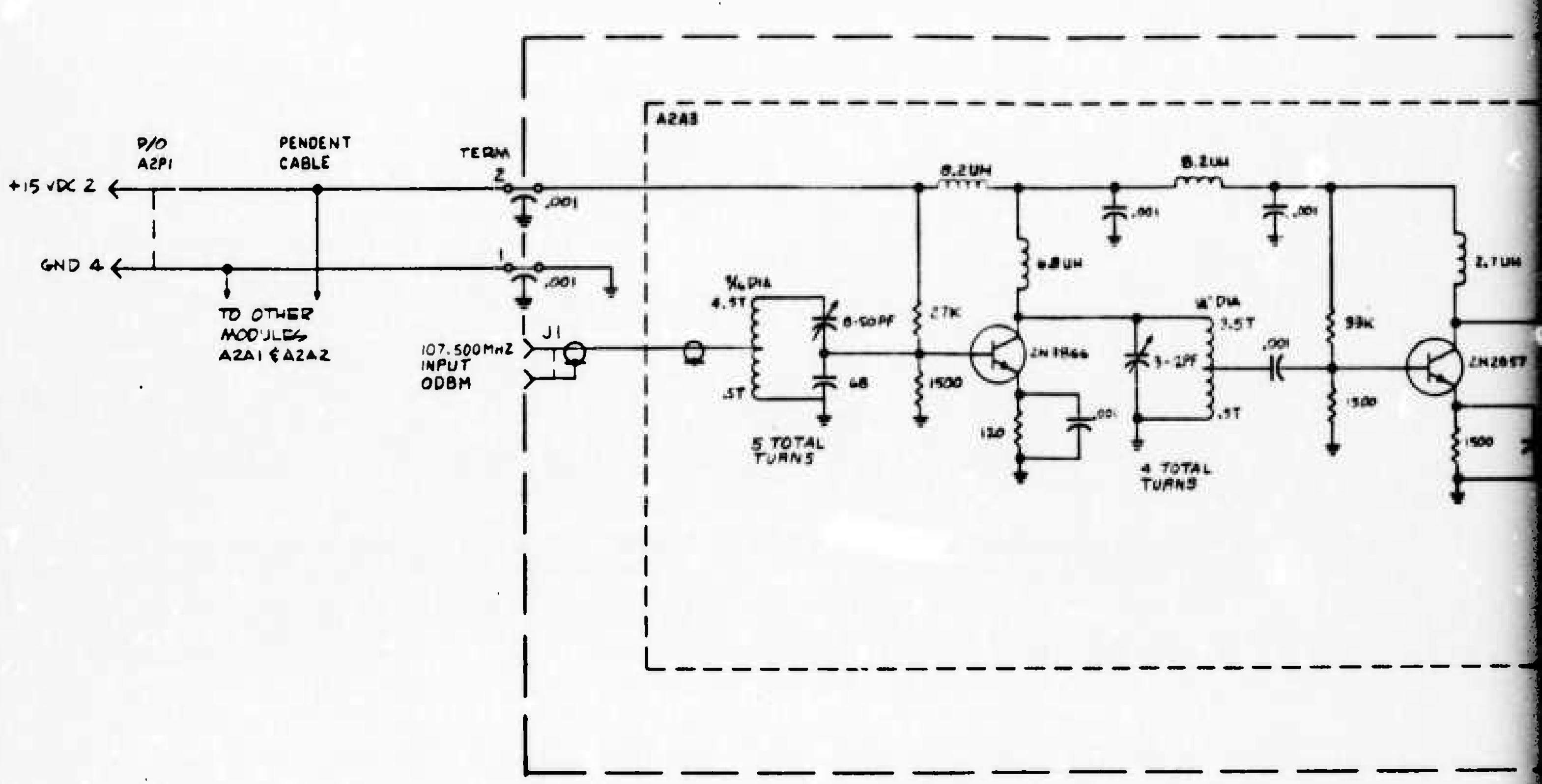
-001

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP J. MURLEY 11-3-73	SCHEMATIC DIAGRAM PACKET RADIO TEST XMTR A2A1 430 MHZ MODULATOR AND A2A2 1370 MHZ MODULATOR WRW
FINISH	HOLE DIAMETERS: UNDER .251 DIA = +.005 .005; .251 TO .500 DIA = +.005 .005; OVER .500 DIA = +.008 .005	CHK	SIZE D — CODE IDENT 13499 — DWG NO 627-9597
	ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	APVD	SCALE NONE — SHEET
	PART SHALL COMPLY TO		

B

NOTES:

1. UNLESS OTHERWISE SPECIFIED,
ALL CAPACITOR VALUES ARE IN MICROFARADS
ALL RESISTANCE VALUES ARE IN OHMS
2. COILS MADE FROM NO 20 BUSS WIRE

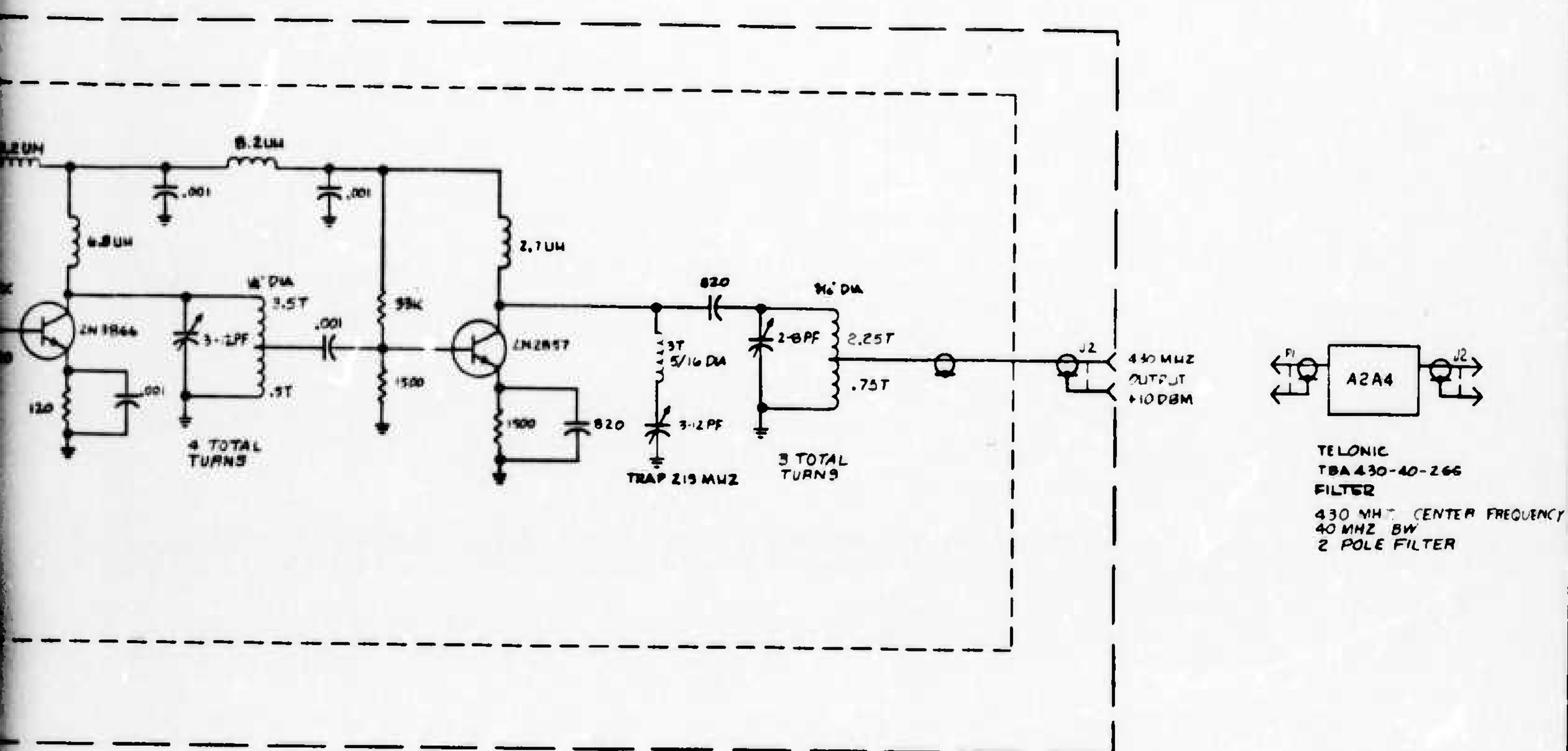


NEXT ASSY

TYPE NO:

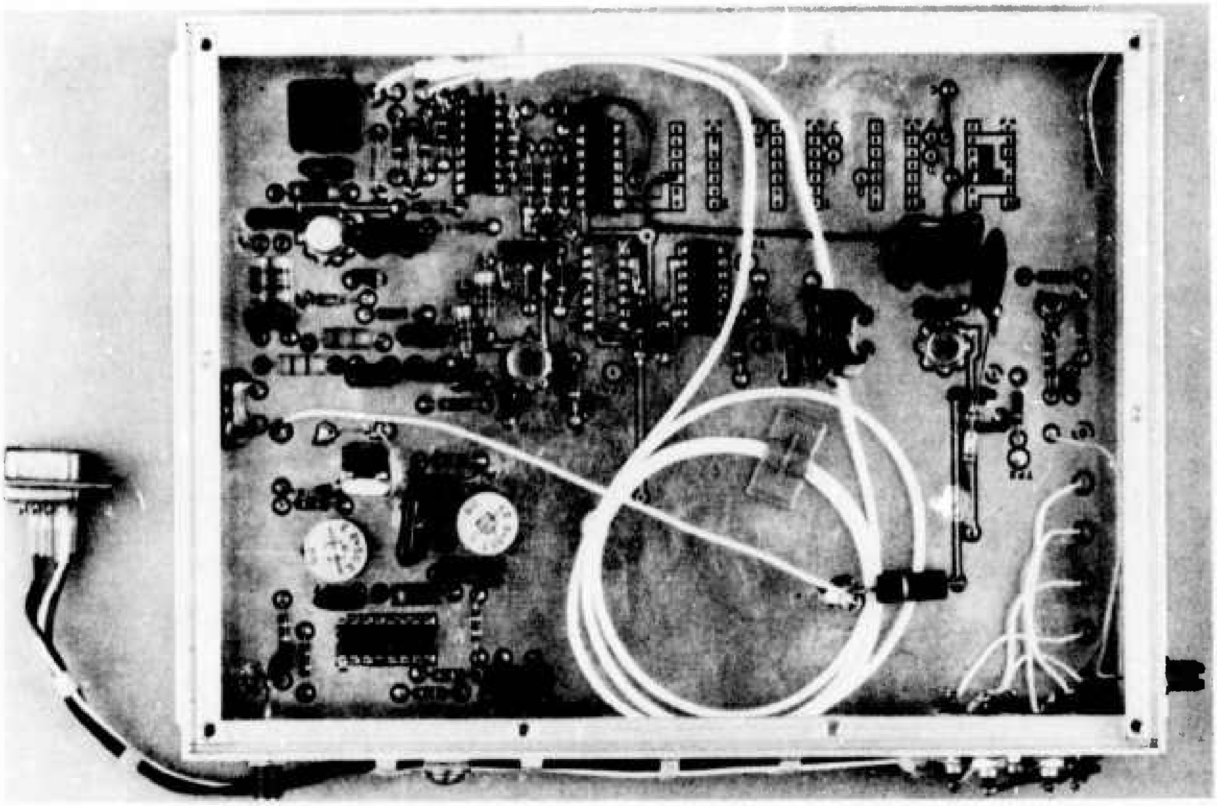
A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

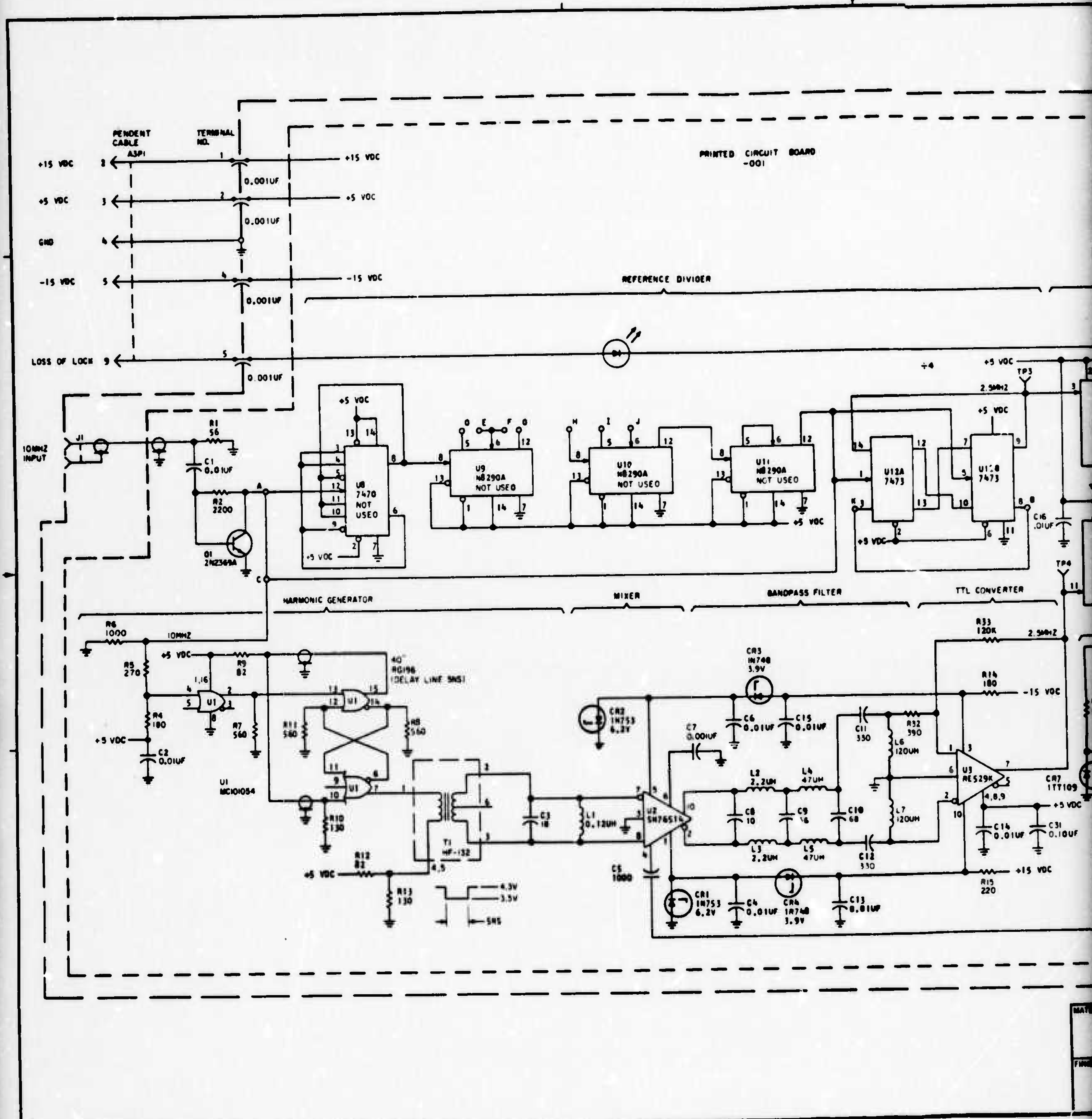


MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP E. AMUNDSEN	DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
FINISH	HOLE DIAMETERS: UNDER .251 DIA = +.005 -.005; .251 TO .500 DIA = +.006 -.005; OVER .500 DIA = +.008 -.005	CHK	WIRING DIAGRAM A2A3 MULTIPLIER PACKET RADIO TEST XMTR
	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9597
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE NONE · SHEET 2 OF 2
	PART SHALL COMPLY TO 580 5400-001		

B

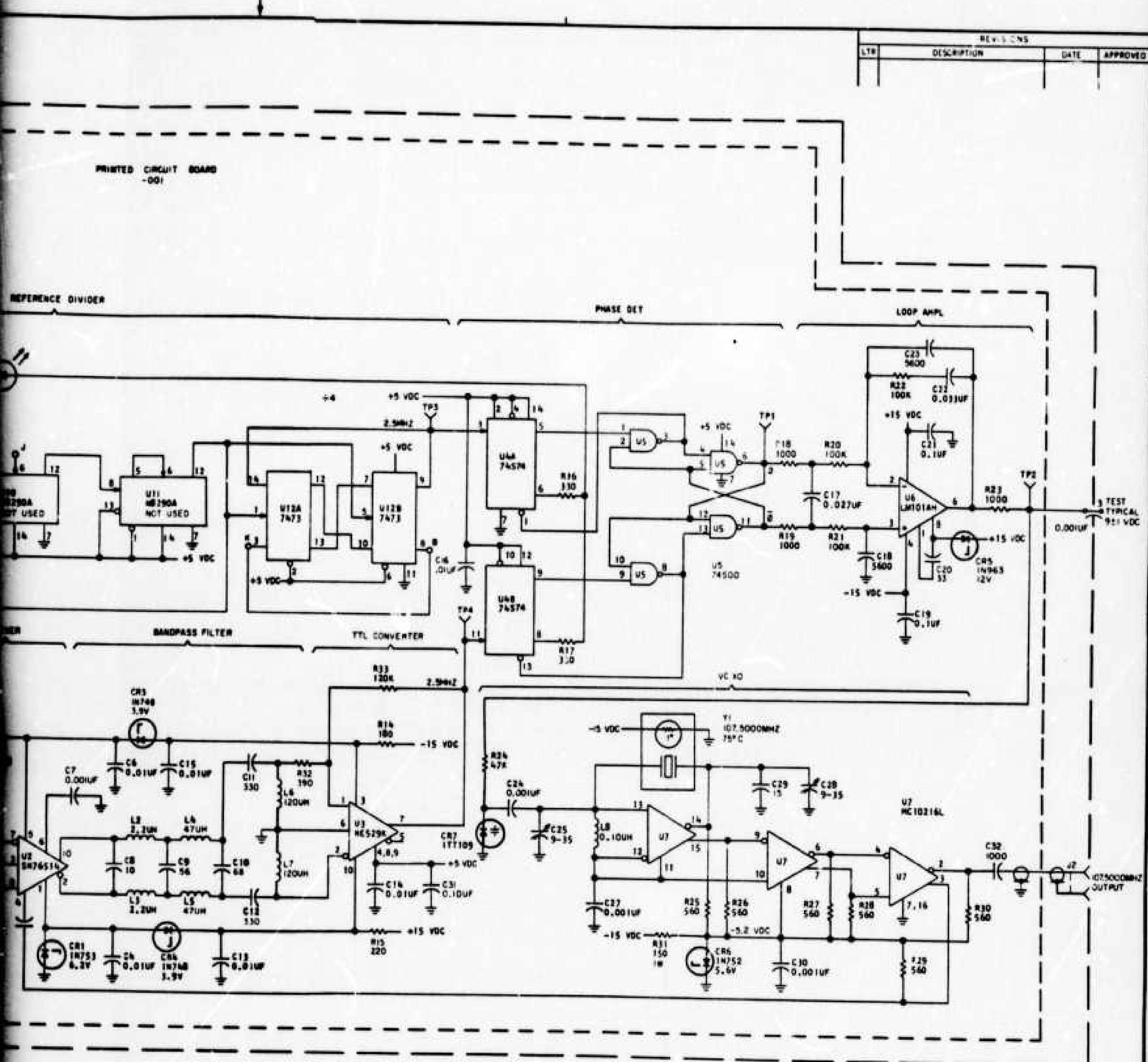


A3 - 430 MHZ XMTR LO



NEXT ASSY: TYPE NO:

A

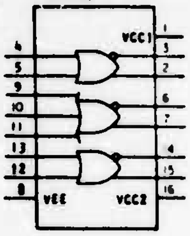


MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
FINISH	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM: .XX = ±.02, .XXX = ±.008	PREP 11-9-73	DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA
	HOLE DIAMETERS: UNDER .251 DIA = +.005 -.005; .251 TO .500 DIA = +.006 -.005; OVER .500 DIA = +.008 -.005	CHK	SCHEMATIC DIAGRAM A3 430MHZ LOCAL OSCILLATOR PACKET RADIO TEST XMTR
	ANGLES: ±1.0°	APVD	SIZE D CODE IDENT 13499 DWG NO 627-9599
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 TIR		SCALE NONE SHEET 1 OF 2

B

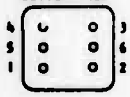
NOTES:

1. U1 MC10105L (MECL)



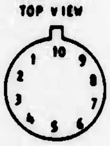
2. T1 Z-MATCH MF 132

BOTTOM VIEW



3. U2 SN76514

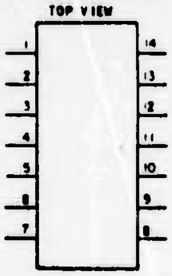
TOP VIEW



1 +VCC
2 OUTPUT
3 FLOATING GND
4 LOCAL OSC INPUT
5 -VCC
6 DECOUPLE 1
7 DECOUPLE 2
8 RF INPUT
9 R C
10 OUTPUT

4. U9 THRU U11 MB290A

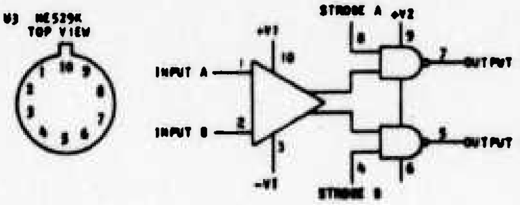
TOP VIEW



1 DATA STROBE
2 C OUT
3 DATA C
4 DATA A
5 A OUT
6 CLOCK 2
7 GND
8 CLOCK 1
9 A OUT
10 DATA B
11 DATA D
12 B OUT
13 DATA RESET
14 VCC

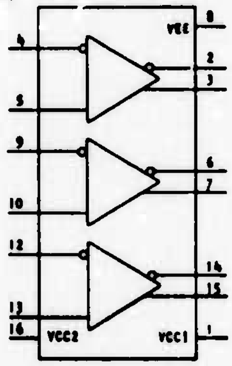
5. U3 NE529K

TOP VIEW

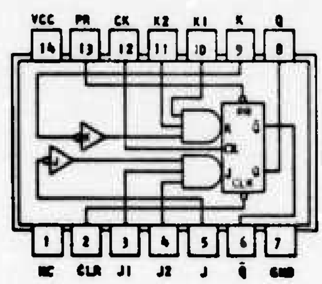


6. U7 MC10216L

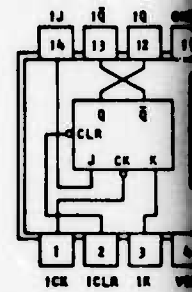
TRIPPLE DIFF AMP (MECL)



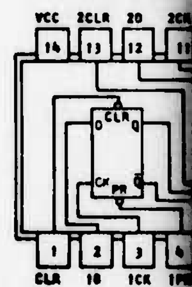
7. U8 TI 7470



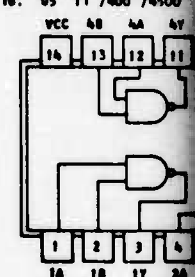
8. U12 TI 7473



9. U4 TI 7474 74S74



10. U5 TI 7400 74S00



NEXT ASSY:

TYPE NO:

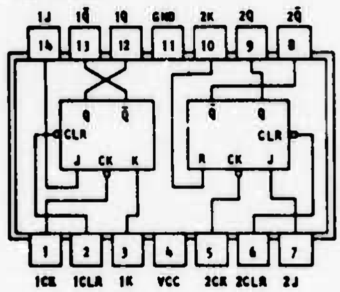
A

OUTPUT A

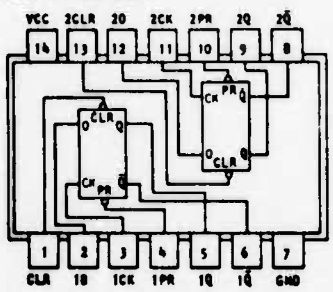
OUTPUT B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

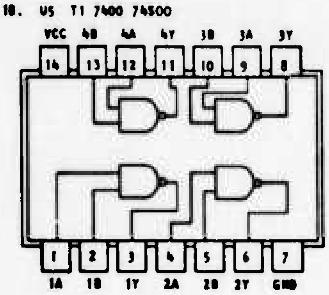
8. U12 TI 7473



9. U4 TI 7474 74S74



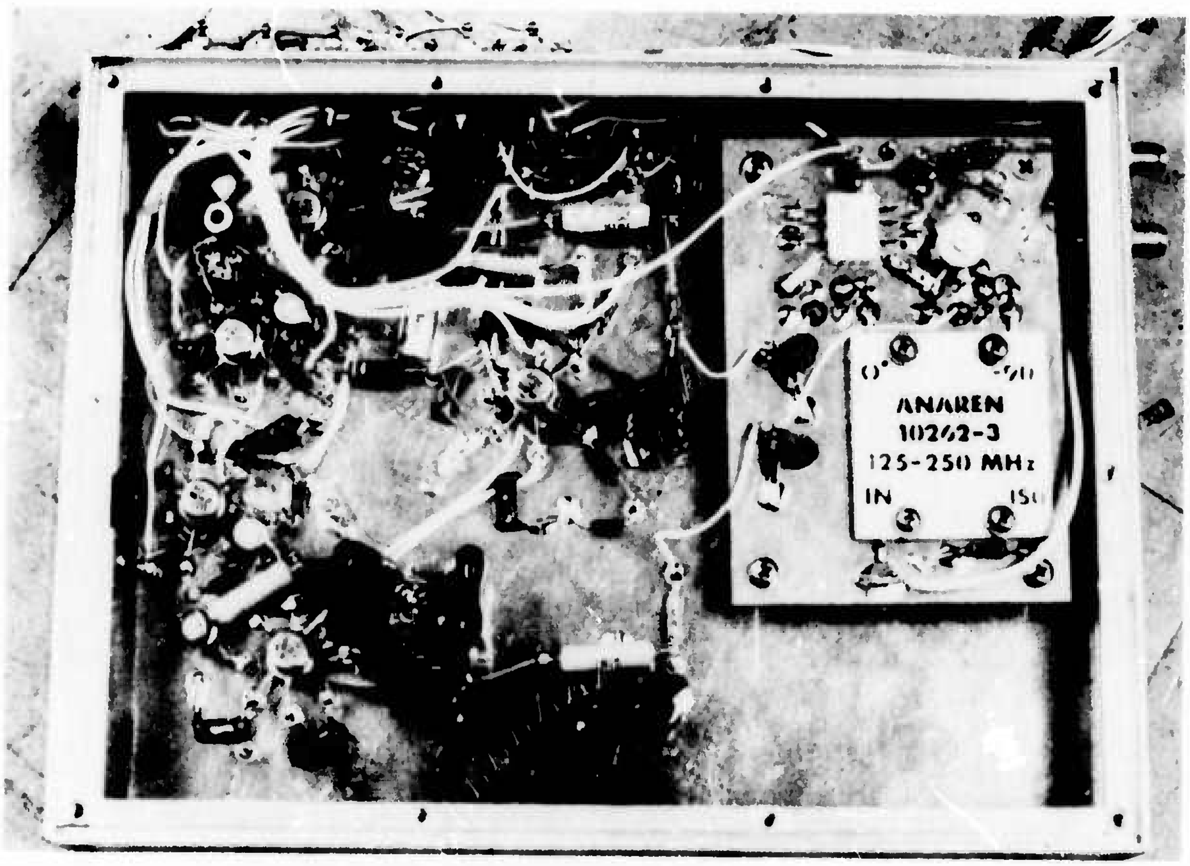
10. U5 TI 7400 74S00



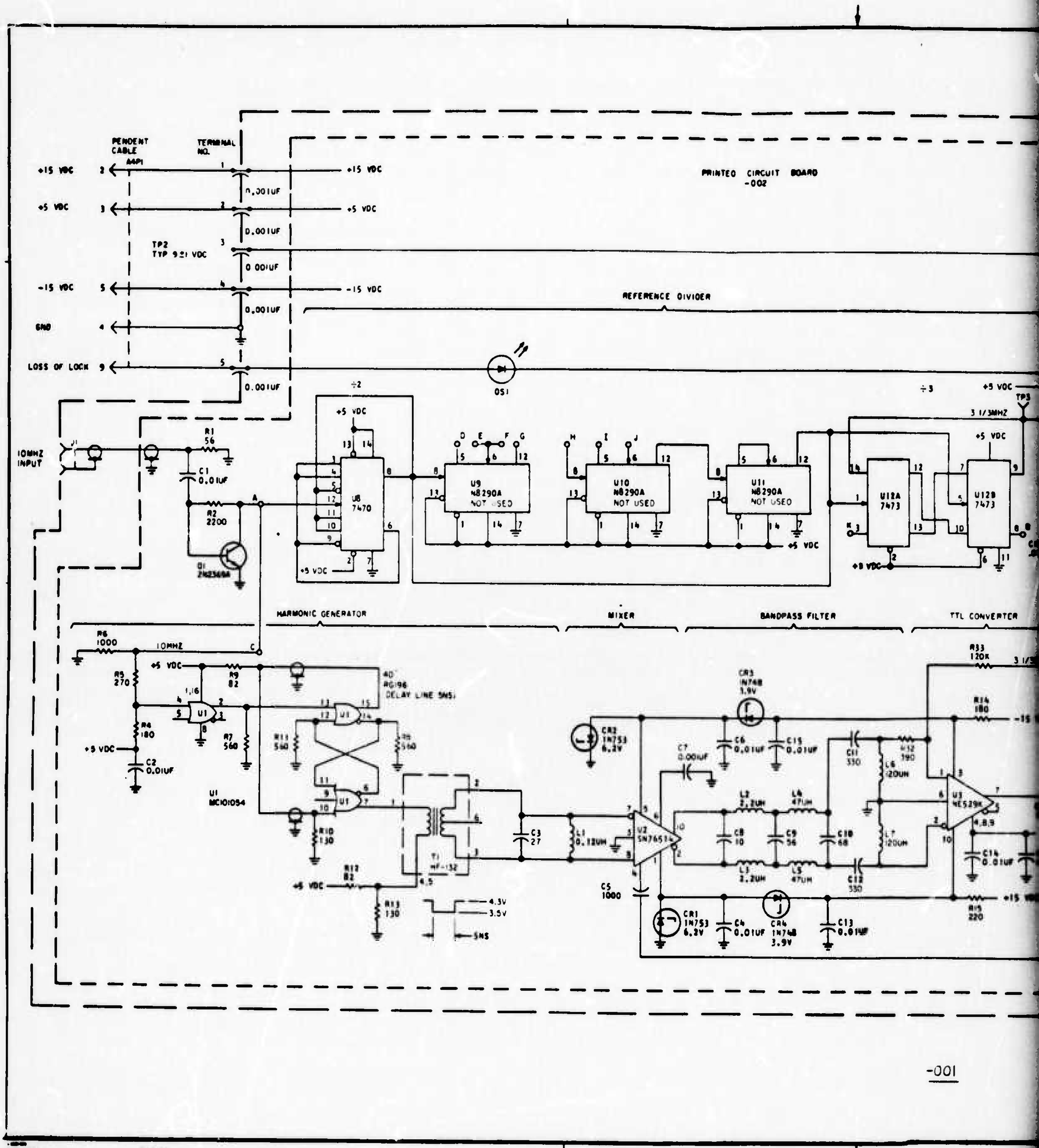
11. UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS
ALL RESISTORS ARE 1/4 W CARBON
ALL CAPACITANCE VALUES ARE IN PICOFARADS.

SIZE	CODE IDENT	DWG NO
D	13499	627-9599
SCALE NONE	REV	SHEET 2 OF 2

B

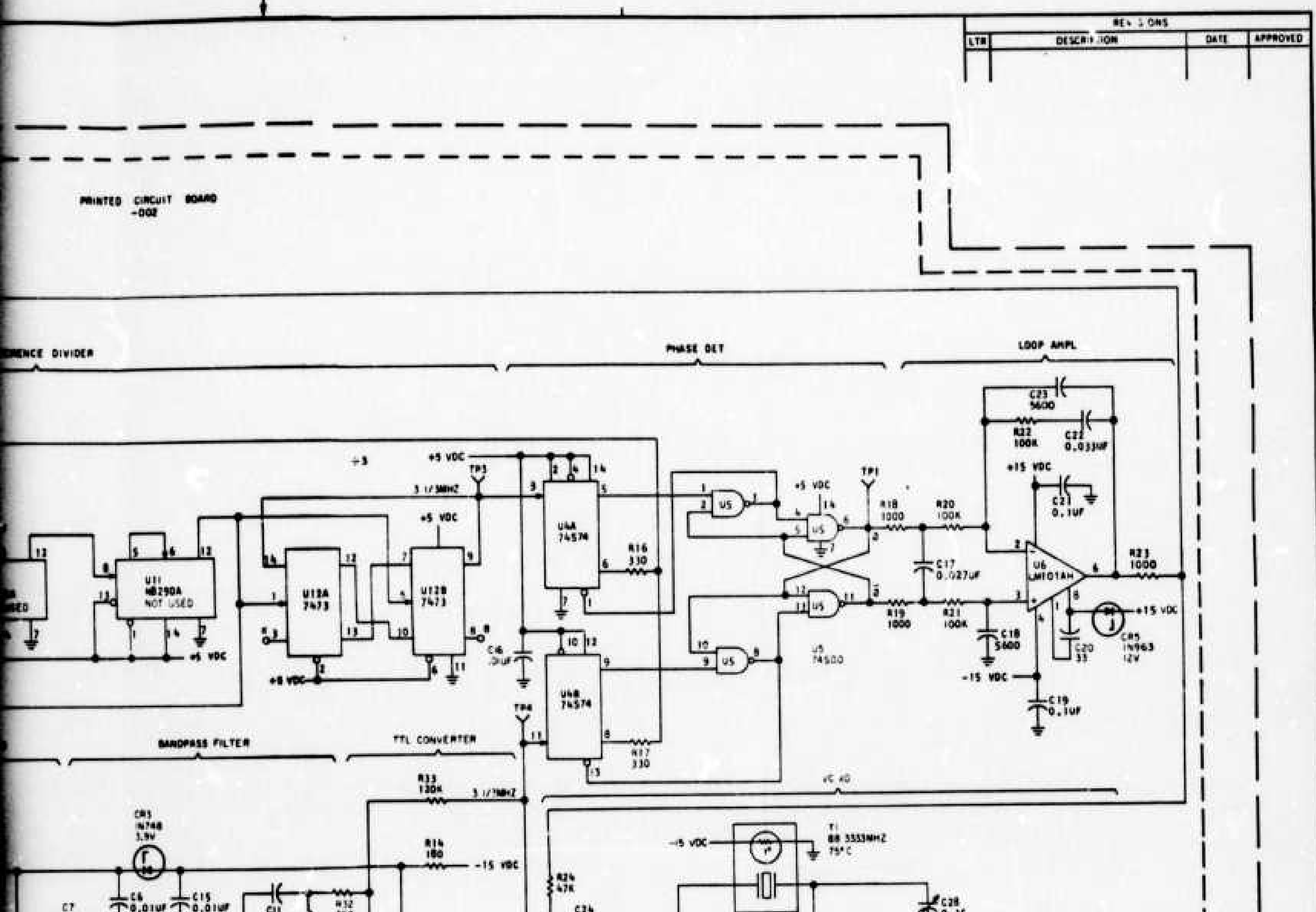


A4 - 1370 MHZ XMTR LO



TEXT ASSY:
TYPE NO:

A



-001

REV A ... 1-25-74

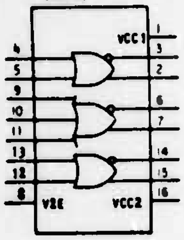
MATERIAL	DIMENSIONS ARE IN INCHES ... ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED ...	CONTRACT NO	COLLINS RADIO COMPANY
FINISH	PART SHALL ...	PREP ... 11-9-73	SCHEMATIC DIAGRAM
		CHK	4A 1270MHZ LOCAL OSCILLATOR
		APVD	... TEST ...
			SIZE D · CODE IDENT 13499 · DWG NO ...27-6598
			SCALE ... · SHEET 1 OF 2

B

4A-125/4A-126

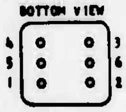
NOTES:

1. U1 MC10105L (MECL)



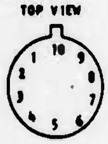
2. T1 Z-MATCH MF 132

BOTTOM VIEW



3. U2 SN76514

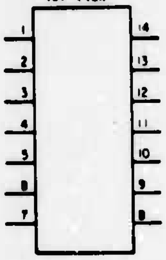
TOP VIEW



1 +VCC
2 OUTPUT
3 FLOATING GND
4 LOCAL OSC INPUT
5 -VCC
6 DECOUPLE 1
7 DECOUPLE 2
8 RF INPUT
9 R C
10 OUTPUT

4. U9 THRU U11 MC290A

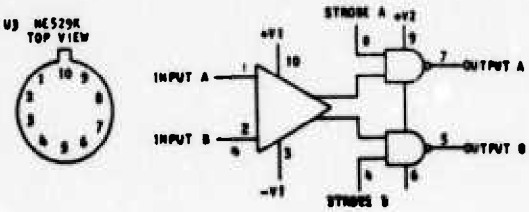
TOP VIEW



1 DATA STROBE
2 C OUT
3 DATA C
4 DATA A
5 A OUT
6 CLOCK 2
7 GND
8 CLOCK 1
9 B OUT
10 DATA B
11 DATA D
12 D OUT
13 DATA RESET
14 VCC

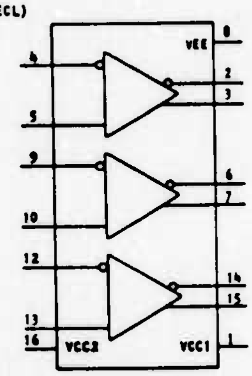
5. U3 NE529K

TOP VIEW

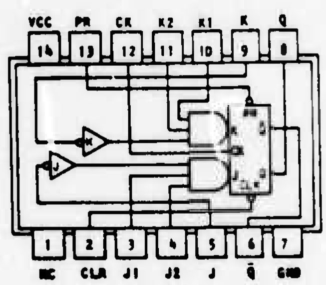


6. U7 MC10216L

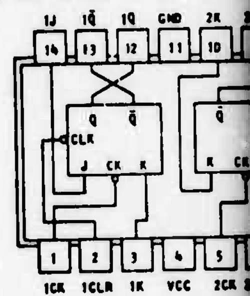
TRIPPLE DIFF AMP (MECL)



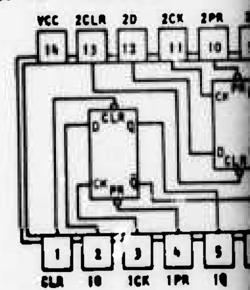
7. U8 TI 7470



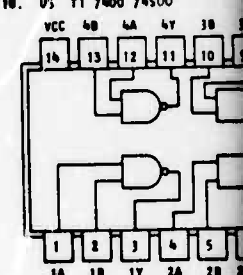
8. U12 TI 7473



9. U4 TI 7474 74S74



10. U5 TI 7400 74S00



A

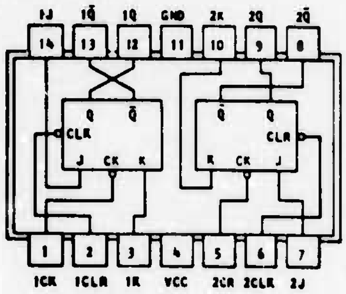
NEXT ASSY: TYPE NO:

OUTPUT A

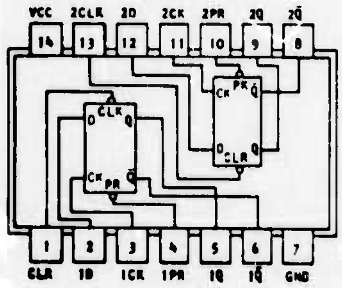
OUTPUT B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

8. U12 TI 7473

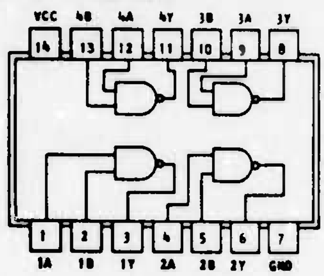


9. U4 TI 7474 74S74



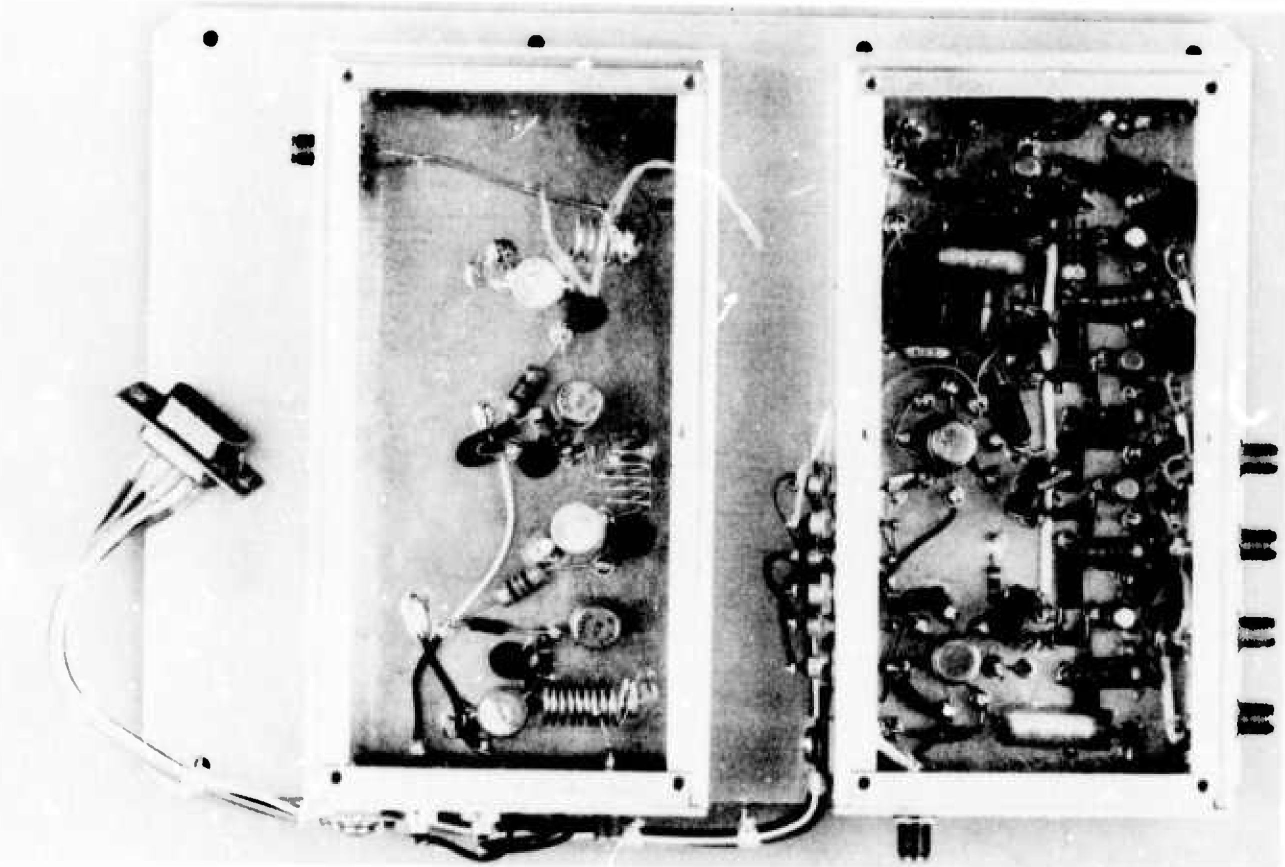
11. UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS
ALL RESISTORS ARE 1/4 W CARBON
ALL CAPACITANCE VALUES ARE IN PICOFARADS.

10. U5 TI 7400 74S00



B

SIZE	CODE IDENT	DWG NO
D	13499	G3?-9593
SCALE NONE	REV	SHEET 2 OF 2

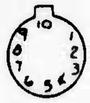


A5( )

NOTES:
1. LM 104 (BOTTON VIEW)

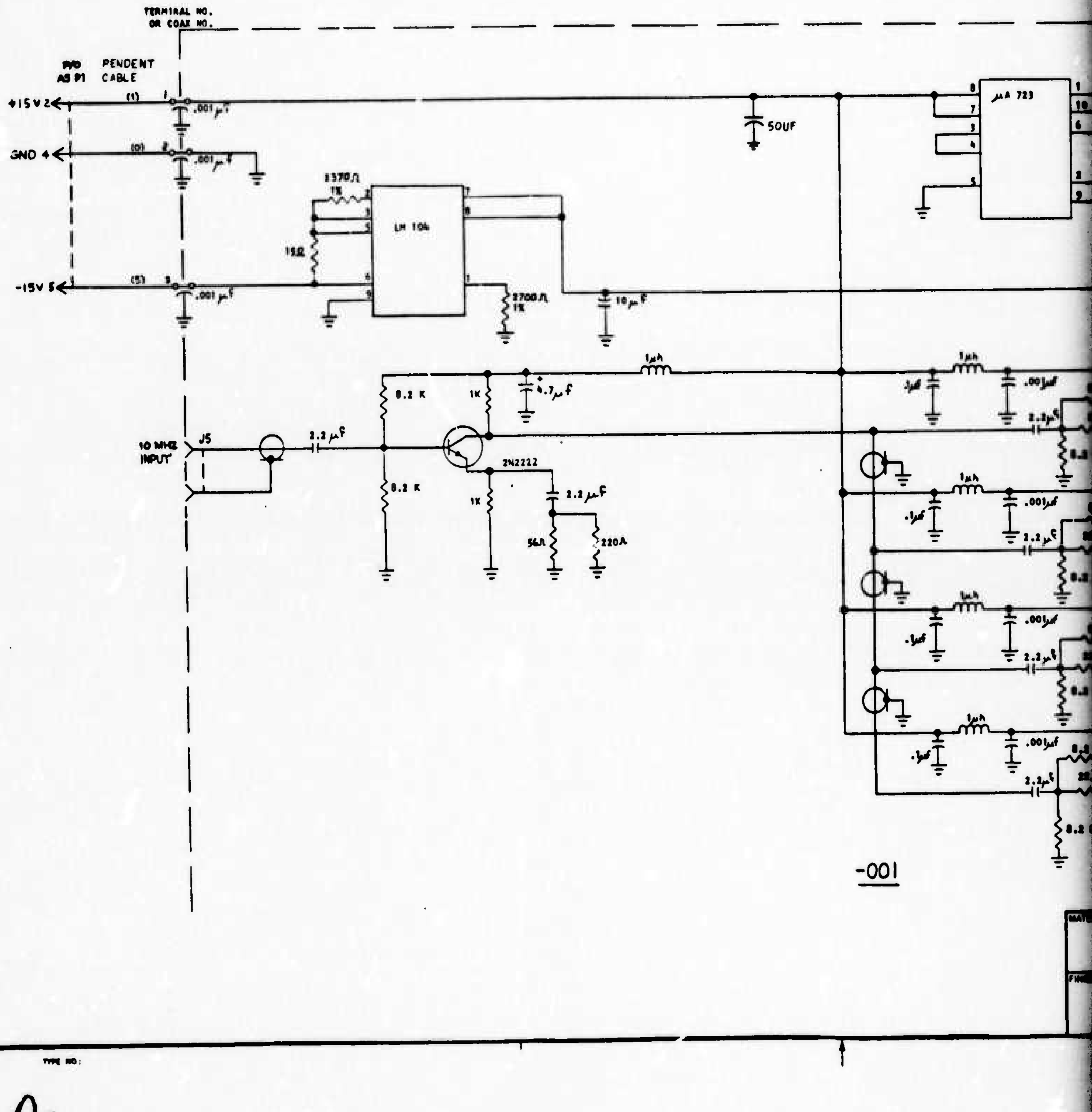
PIN 1. ADJUST
2. REFERENCE
3. REF SUPPLY
4. COMPENSATION
5. UNREGULATED INPUT (CONNECTED TO CASE)
6. CURRENT LIMIT
7. BOOSTER
8. REGULATED OUTPUT
9. GROUND
10. NO CONNECTION

2. UA 723 (BOTTOM VIEW)



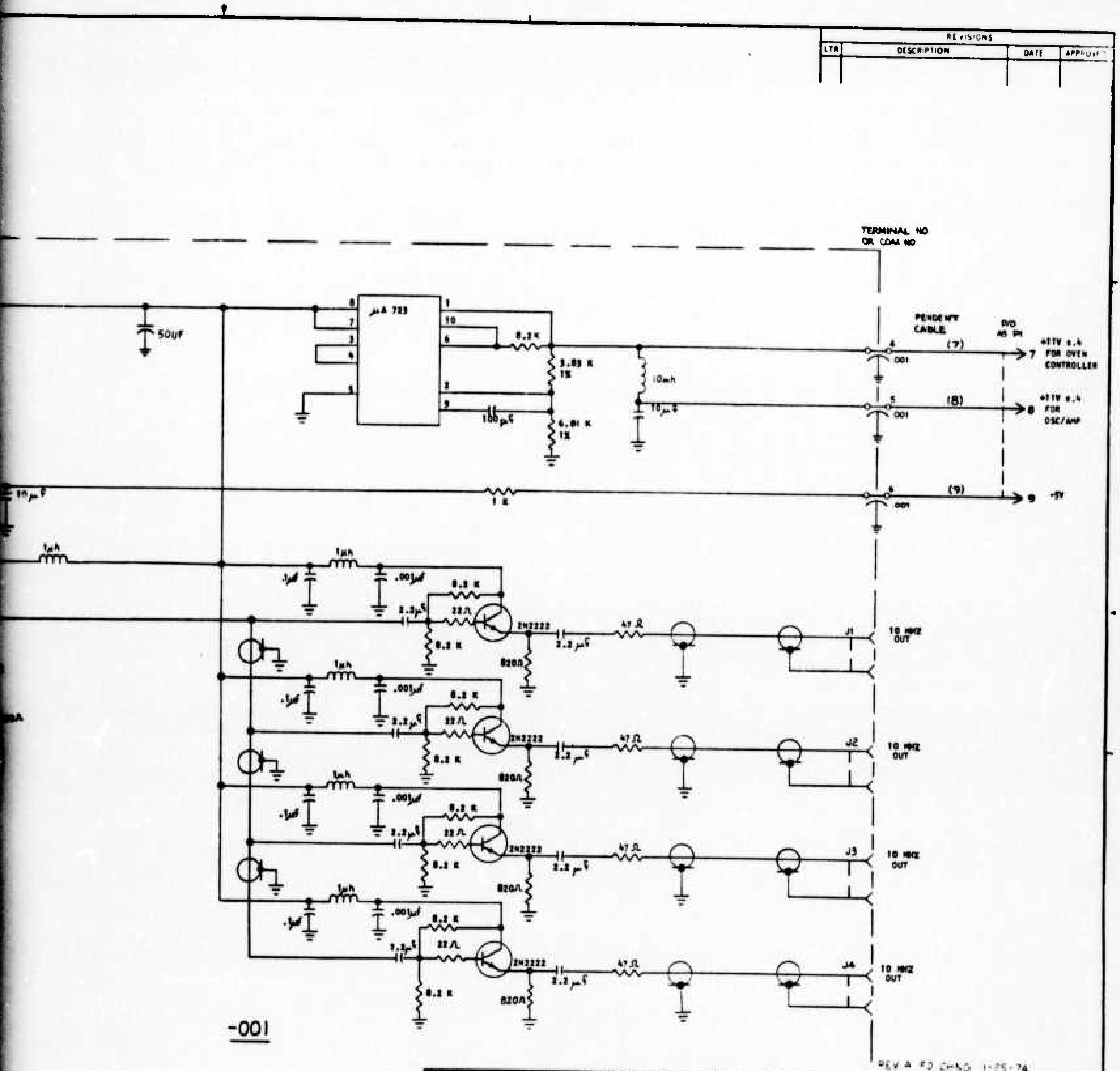
PIN 1. CURRENT SENSE
2. INVERTING INPUT
3. NON INVERTING INPUT
4. V REF
5. -V (CONNECTED TO CASE)
6. V OUT
7. V OUTPUT COLLECTOR
8. V+
9. FREQUENCY COMPENSRTION
10. CURRENT LIMIT

3. PENDENT CRBLE IS NO. 22 TEFLON WIRE OF COLOR CODE NOTED IN ()



NEXT ASSY: TYPE NO:

A

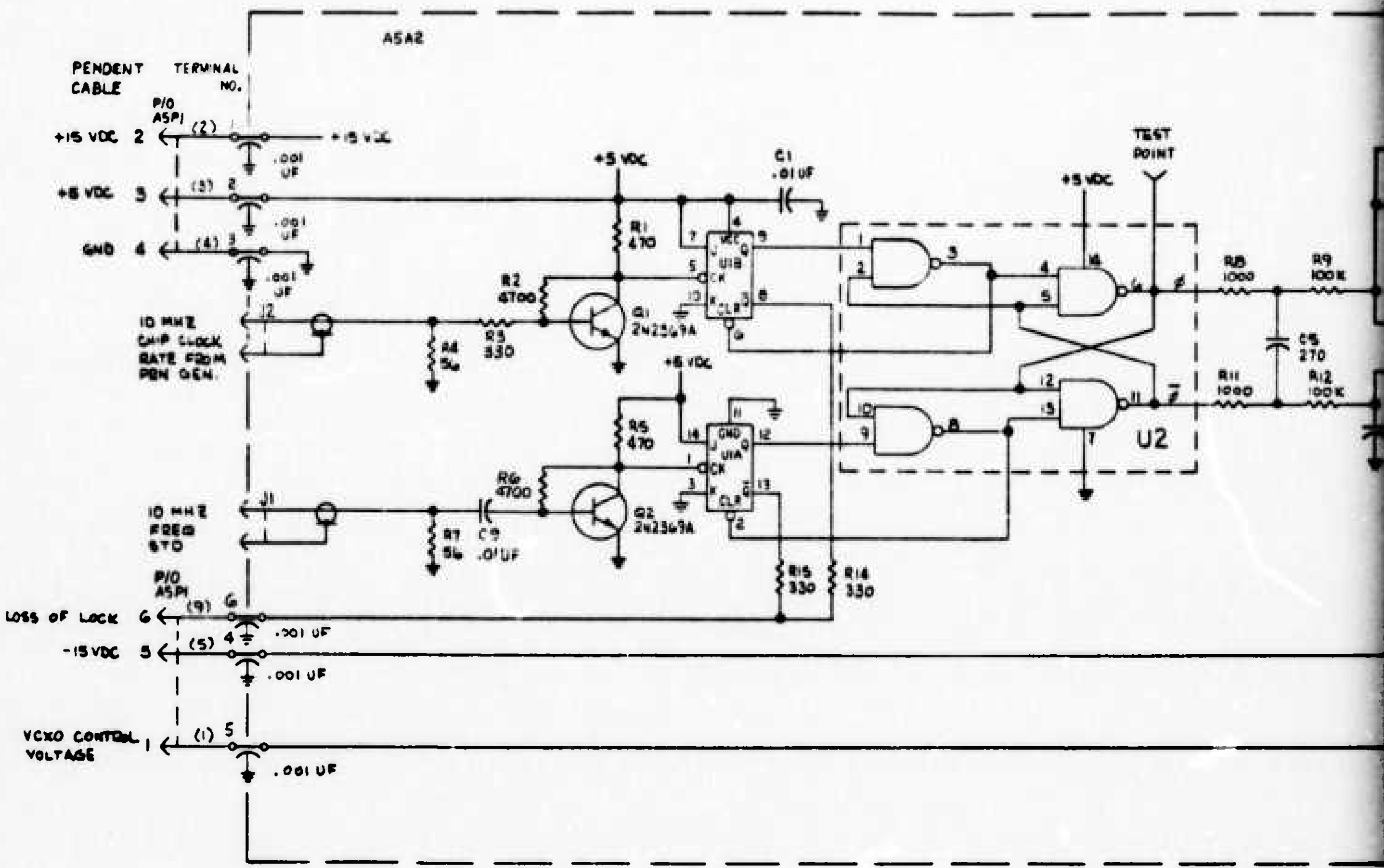


MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
FINISH	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX ± ±.02, .XXX ± ±.008 HOLE DIAMETERS: UNDER .251 DIA ± +.005 .005 .251 TO .500 DIA ± +.006 .005 OVER .500 DIA ± +.008 .005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA PART SHALL COMPLY TO	PREP CHK APVD	DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA SCHEMATIC DIAGRAM ASAI FREQ STD POWER/RF DIVIDER PACKET TEST AMTR SIZE D CODE IDENT 13499 DWG NO 627-9600 SCALE NONE SHEET 1 OF 2

B

NOTES:

1. ALL RESISTORS 1/4 W 10% UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS IN PICOFARADS UNLESS OTHERWISE NOTED.
3. U2 IS 74S00
4. U1 IS 74S73

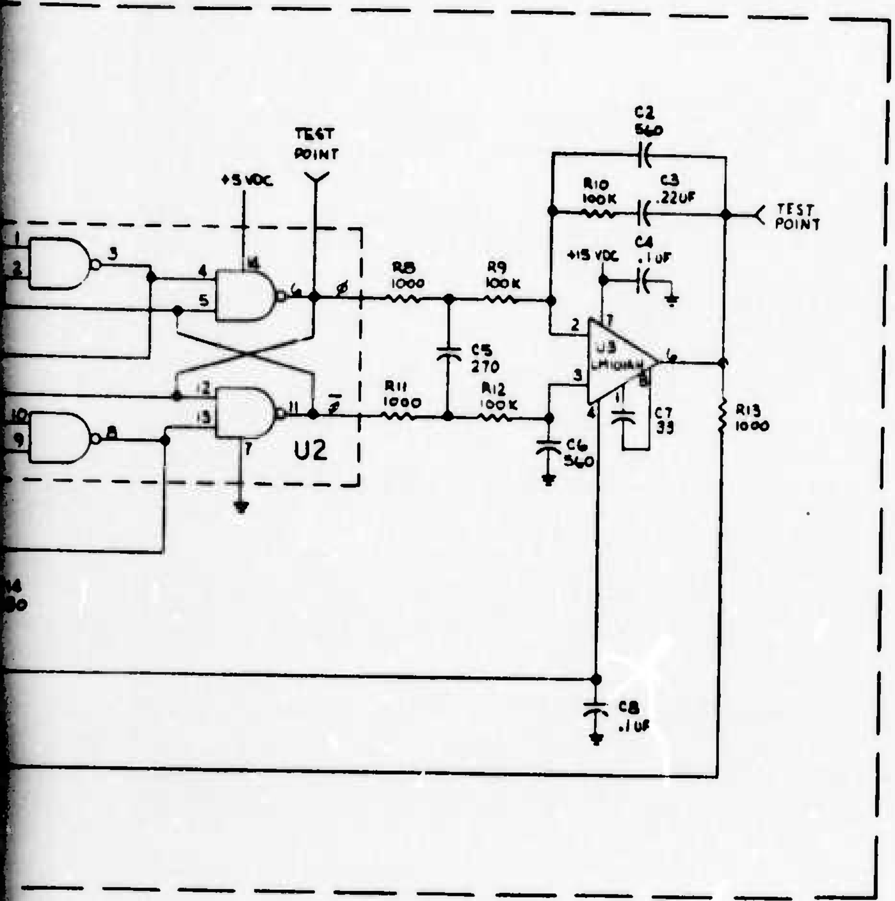


NEXT ASSY:

TYPE

A

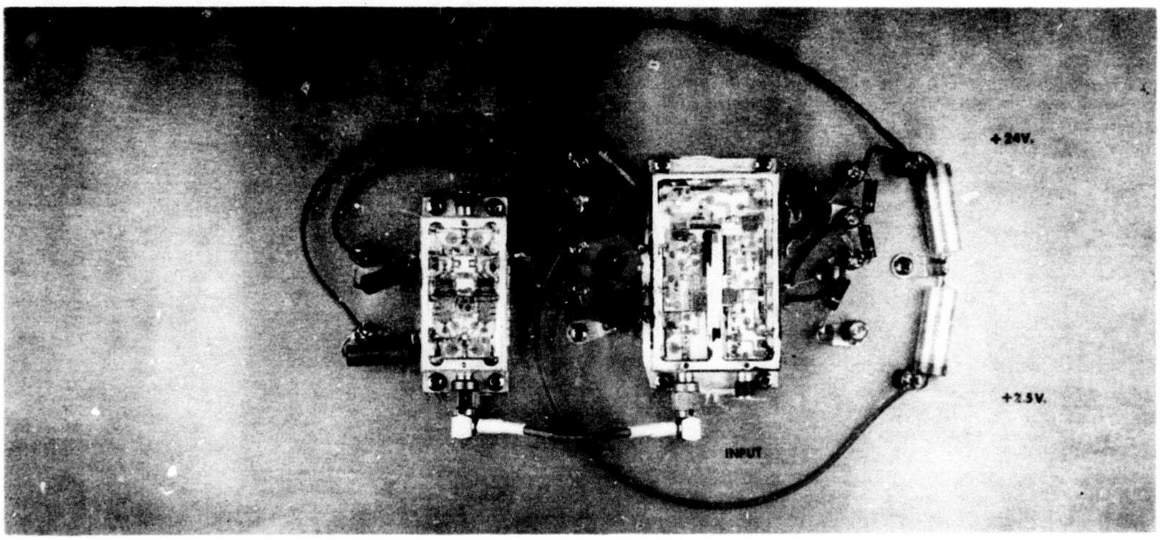
LTR	DESCRIPTION	DATE	APPROVED



REV A FD CHG 1-25-74

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX ± .02, .XXX ± .008	PREP J. MOSLEY 11-6-73	SCHEMATIC DIAGRAM A5A2 PHASE LOCK PACKET RADIO TEST XMTR
FINISH	HOLE DIAMETERS: UNDER .251 DIA +.005 .005; .251 TO .500 DIA +.006 .005; OVER .500 DIA +.008 .005	CHK	SIZE D · CODE IDENT 13499 · DWG NO 627-9600
	ANGLES: ±1.0°	APVD	
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE · SHEET 2 OF 2
	PART SHALL COMPLY TO		

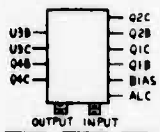
B



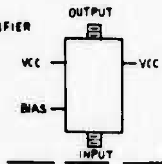
A9 - 430 MHZ PA

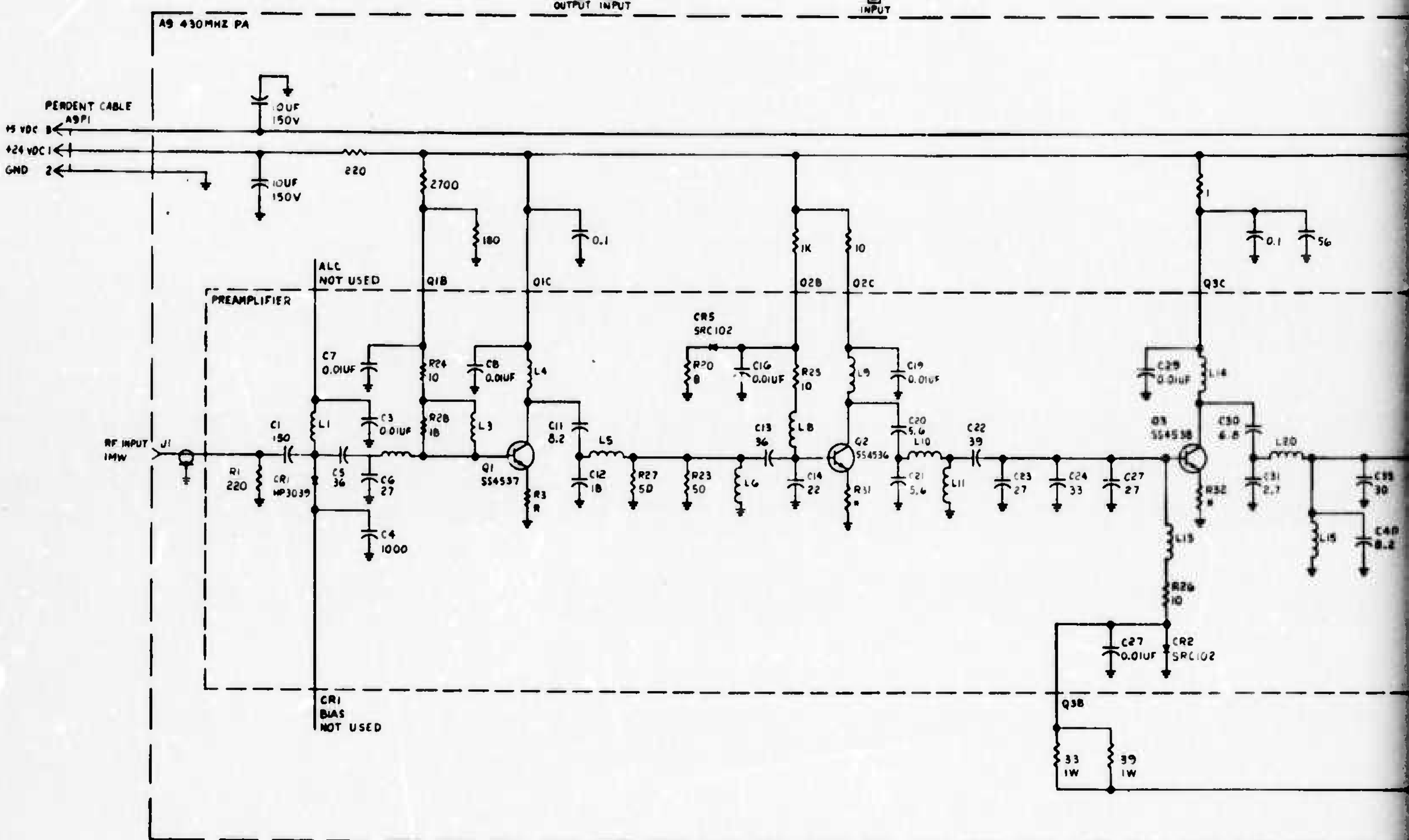
NOTES.
1. UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS.
ALL CAPACITANCE VALUES ARE IN PICOFARADS.
ALL INDUCTANCE VALUES ARE IN NANOHENRYS.
2. R30, R31, R32 AND R33, AS INDICATED BY ASTERISK (*) ARE A PART OF TRANSISTORS Q1, Q2, Q3, AND Q4.

3. PREAMP



4. AMPLIFIER



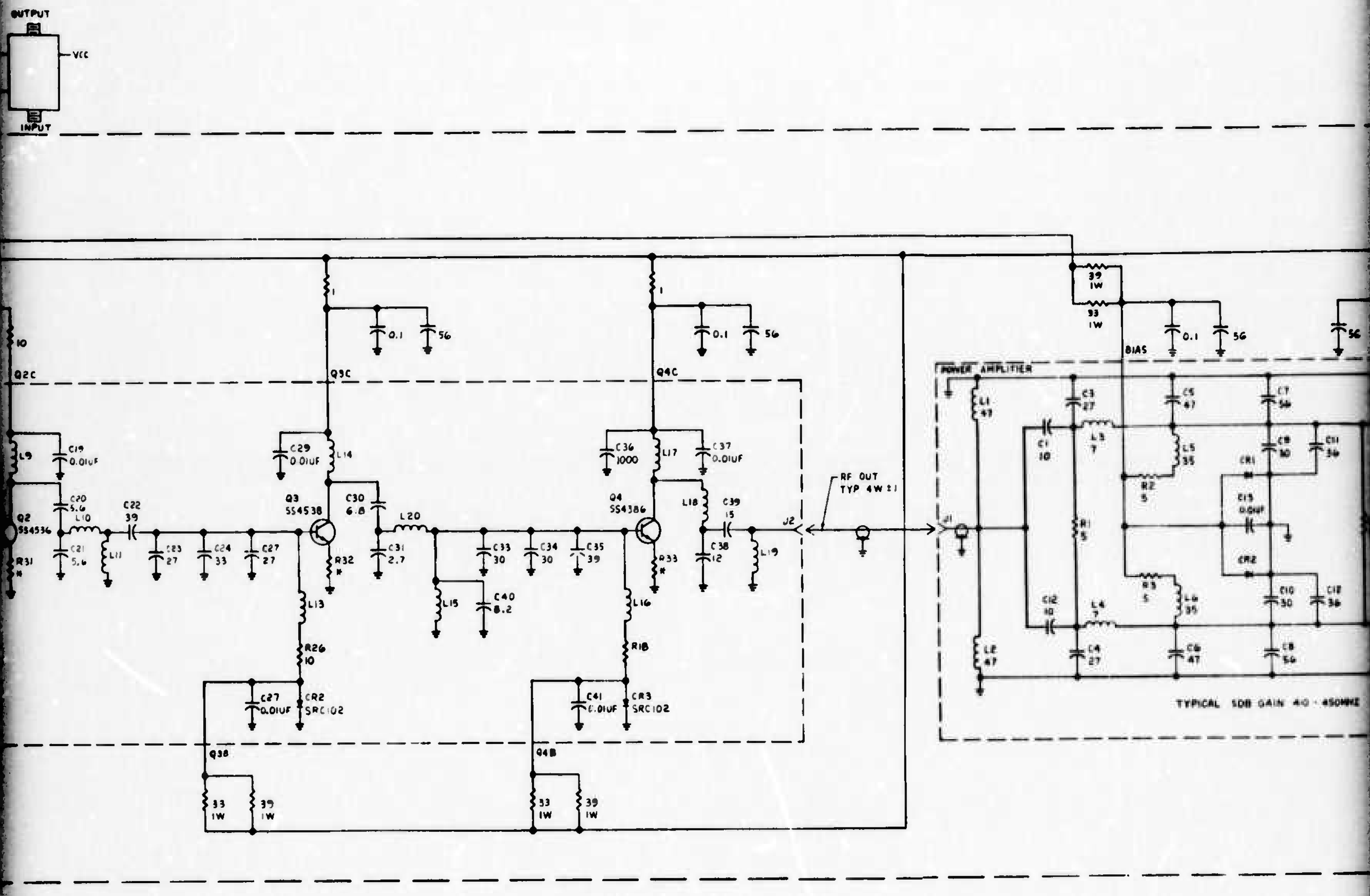


627-9651	3/3

627-9651	2/3

B

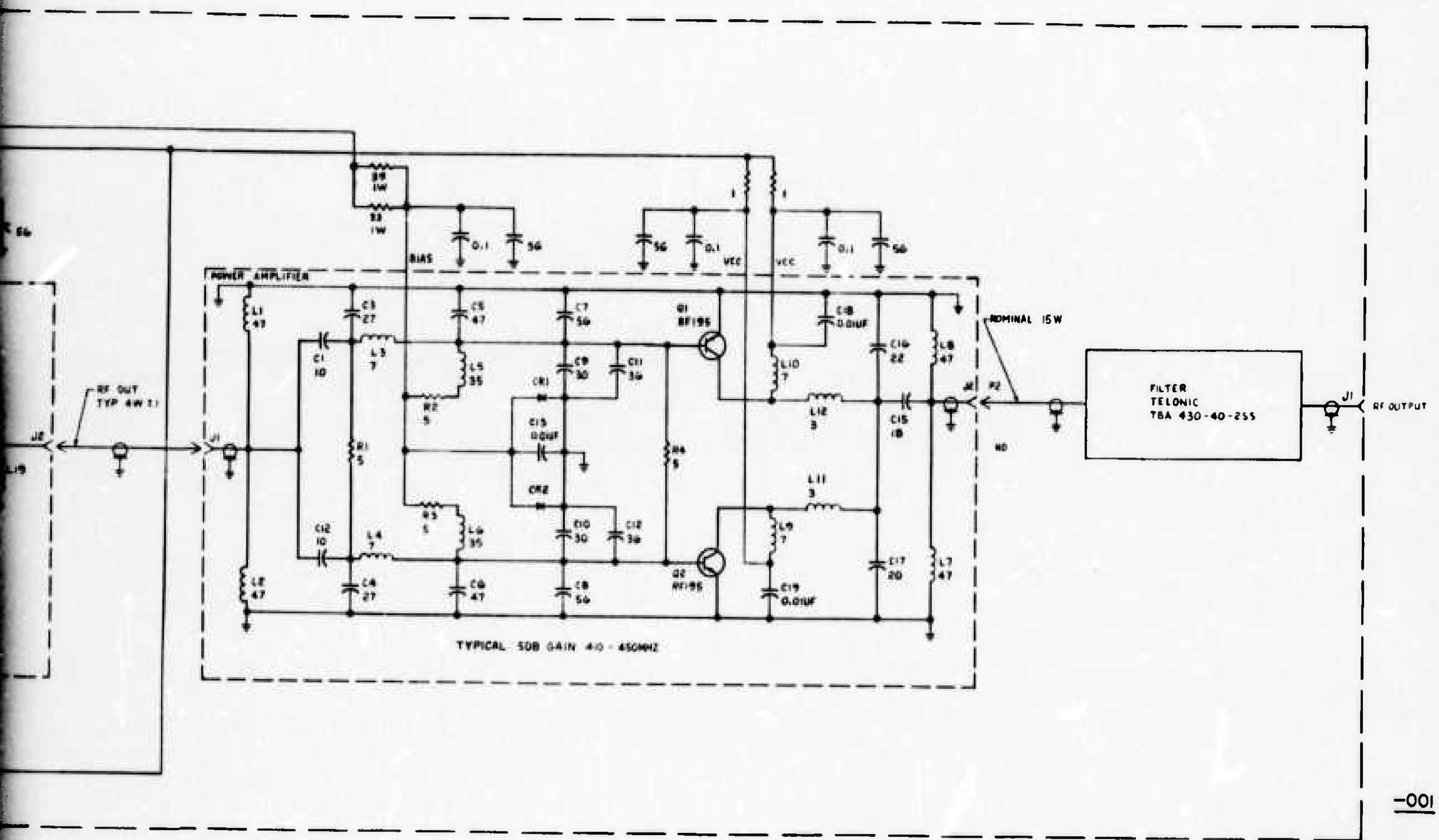
A



B

PART NUMBER	FRAME
627-9651	1/3

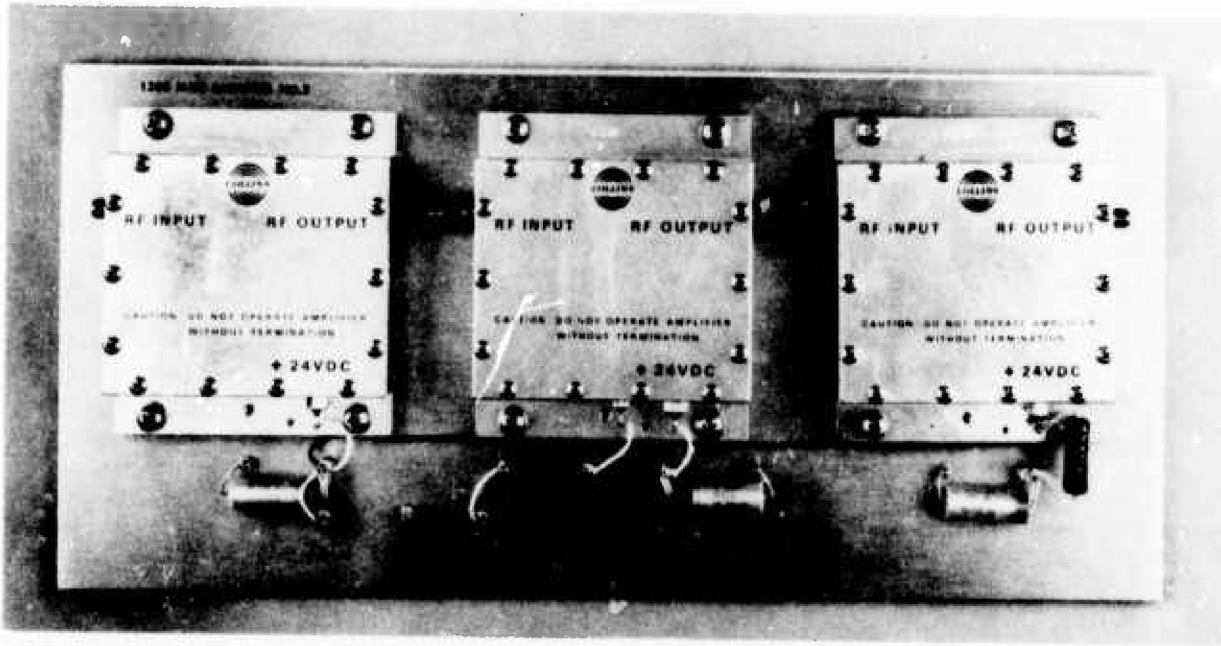
REVISIONS				
	LTR	DESCRIPTION	DATE	APPROVED



PUBLICATIONS DRAWING
REVISIONS TO BE APPROVED AND MADE BY PUBLICATIONS ILLUSTRATING DEPARTMENT

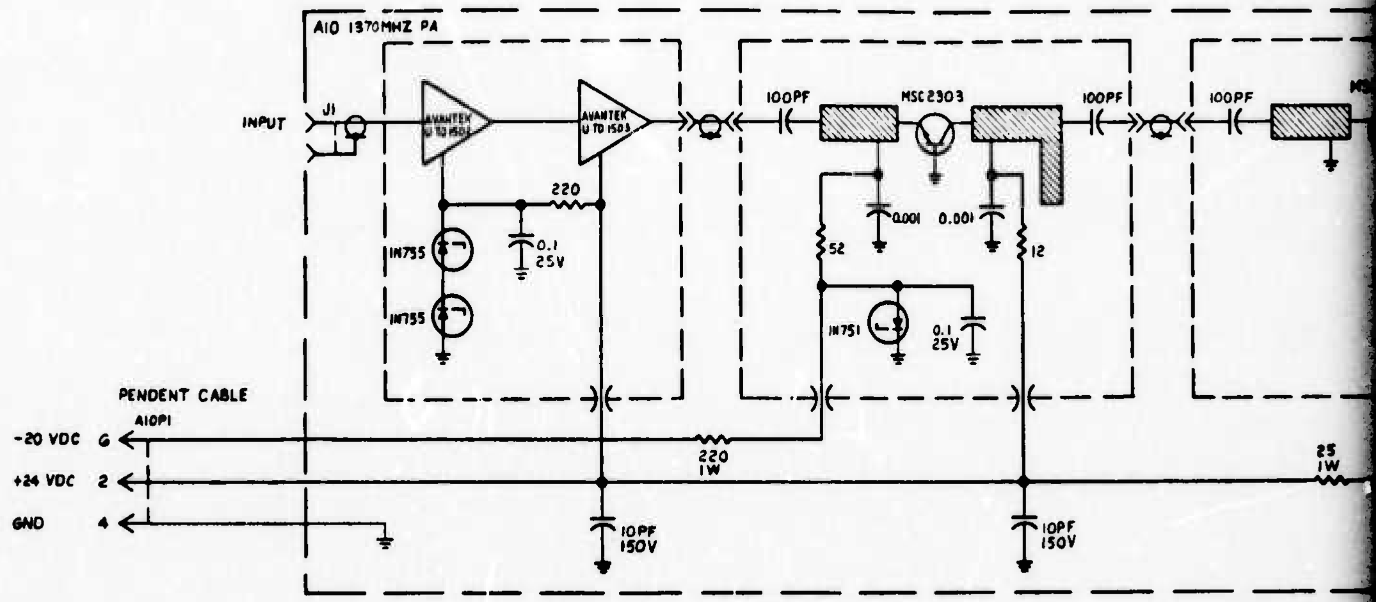
CONTRACT NO	COLLINS RADIO COMPANY DALLAS TEX NEWPORT BEACH CALIF CEDAR RAPIDS IA
PREP E W Klingbeil 11-19-73	SCHEMATIC DIAGRAM A9 430MHZ PA PACKET RADIO TEST XMTR
CHK	SIZE D CODE IDENT 13499 DWG NO 627-9651
APVD	SCALE NONE SHEET

PART NUMBER	FRAME
627-9651	1/3



A10 - 1370 MHZ PA

NOTES:
1 UNLESS OTHERWISE SPECIFIED
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROFARADS

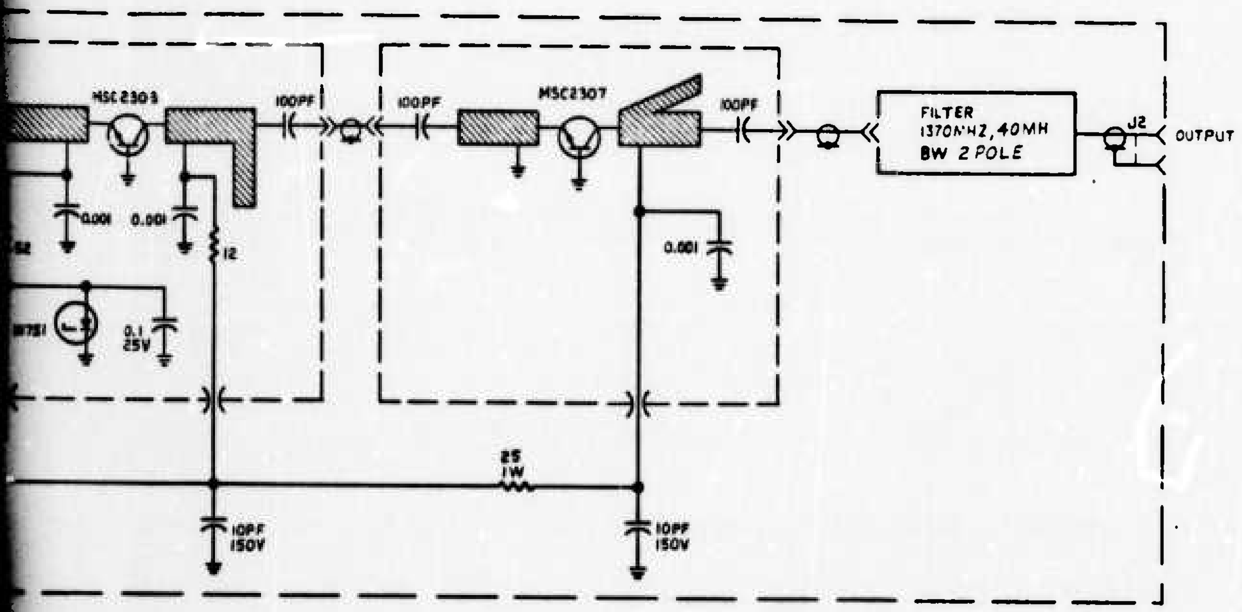


-001

NEXT ASSY: TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

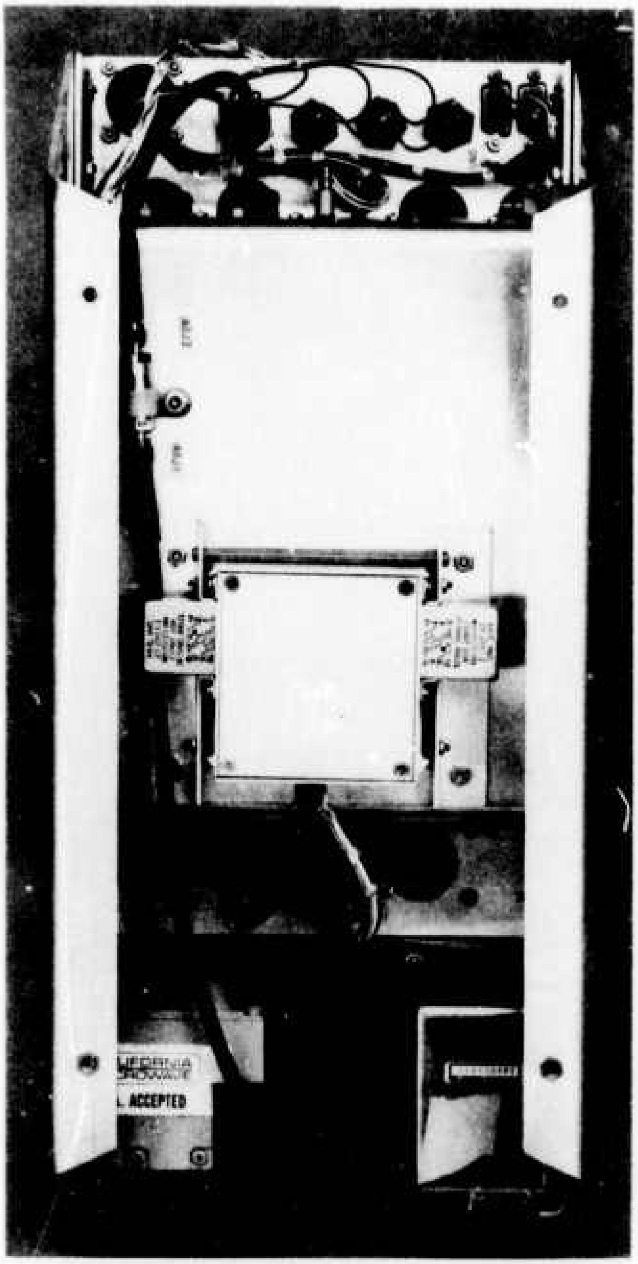


-001

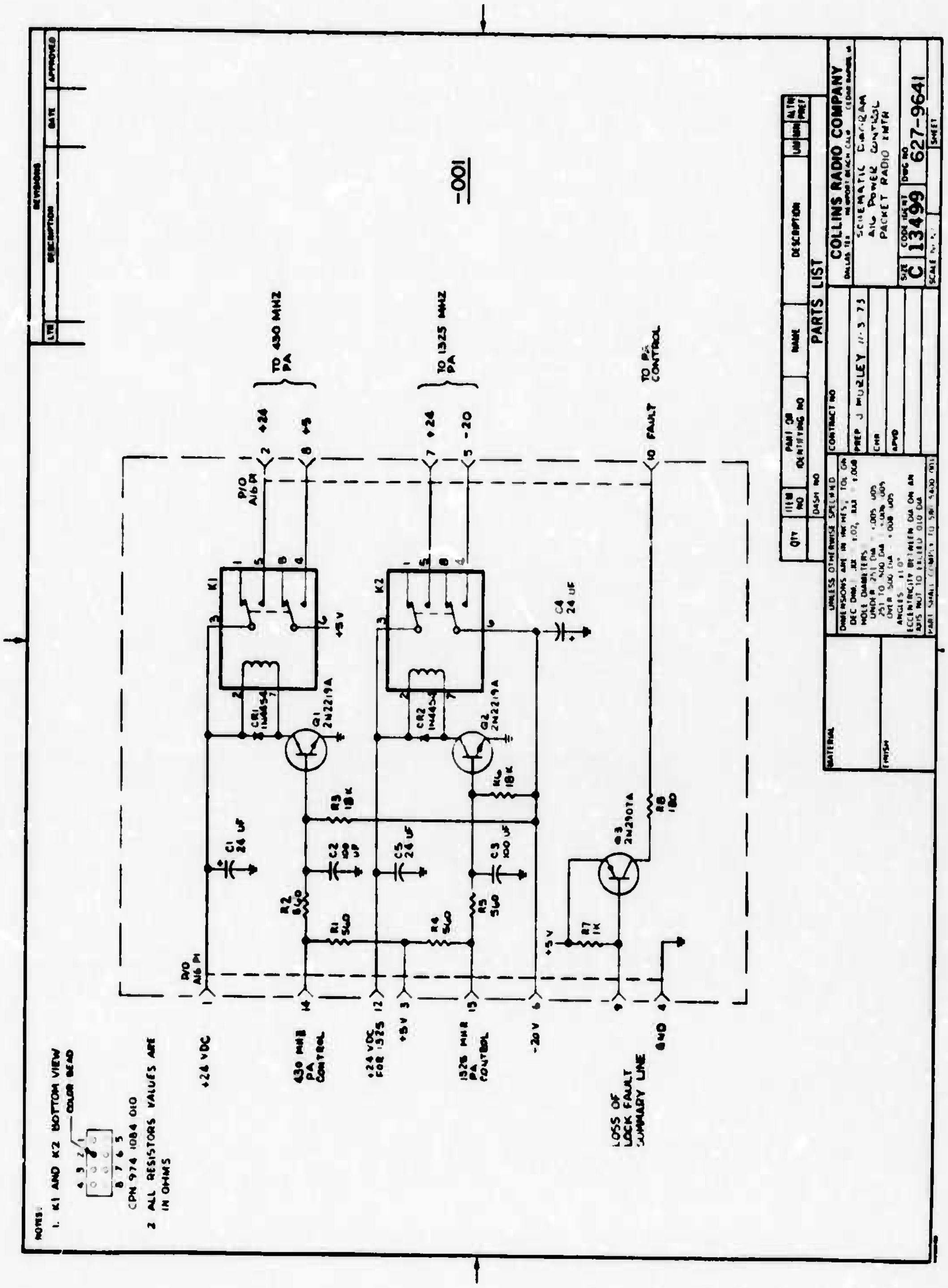
MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	COLLINS RADIO COMPANY
	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008	PREP 11-16-73	DALLAS, TEX NEWPORT BEACH CALIF CEDAR RAPIDS, IA
FINISH	HOLE DIAMETERS: UNDER .251 DIA = +.005 -.005; .251 TO .500 DIA = +.006 -.005; OVER .500 DIA = +.008 -.005	CHK	SCHEMATIC DIAGRAM A10 1370MHZ PA PACKET RADIO TEST SET
	ANGLES: ±1.0°	APVD	SIZE D · CODE IDENT 13499 · DWG NO 627-9652
	ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA		SCALE NONE · SHEET
	PART SHALL COMPLY TO 580 5400 001		

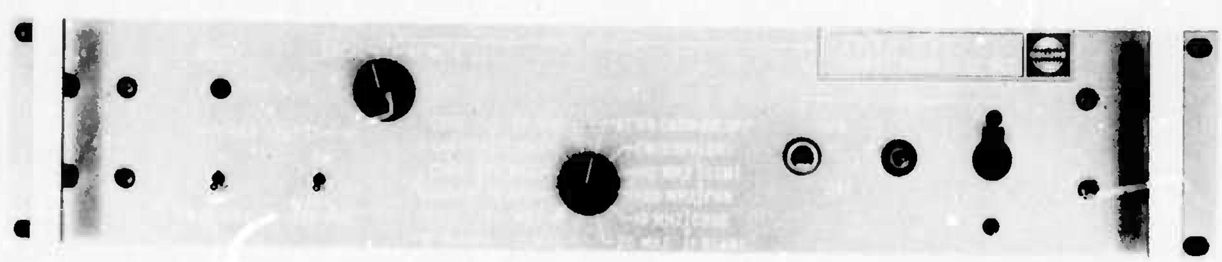
PRO ☐ NFP ☐ RE. ☐ REV_ _ TC_ Y CR 0 NB 0 DL 2 TO 0

B

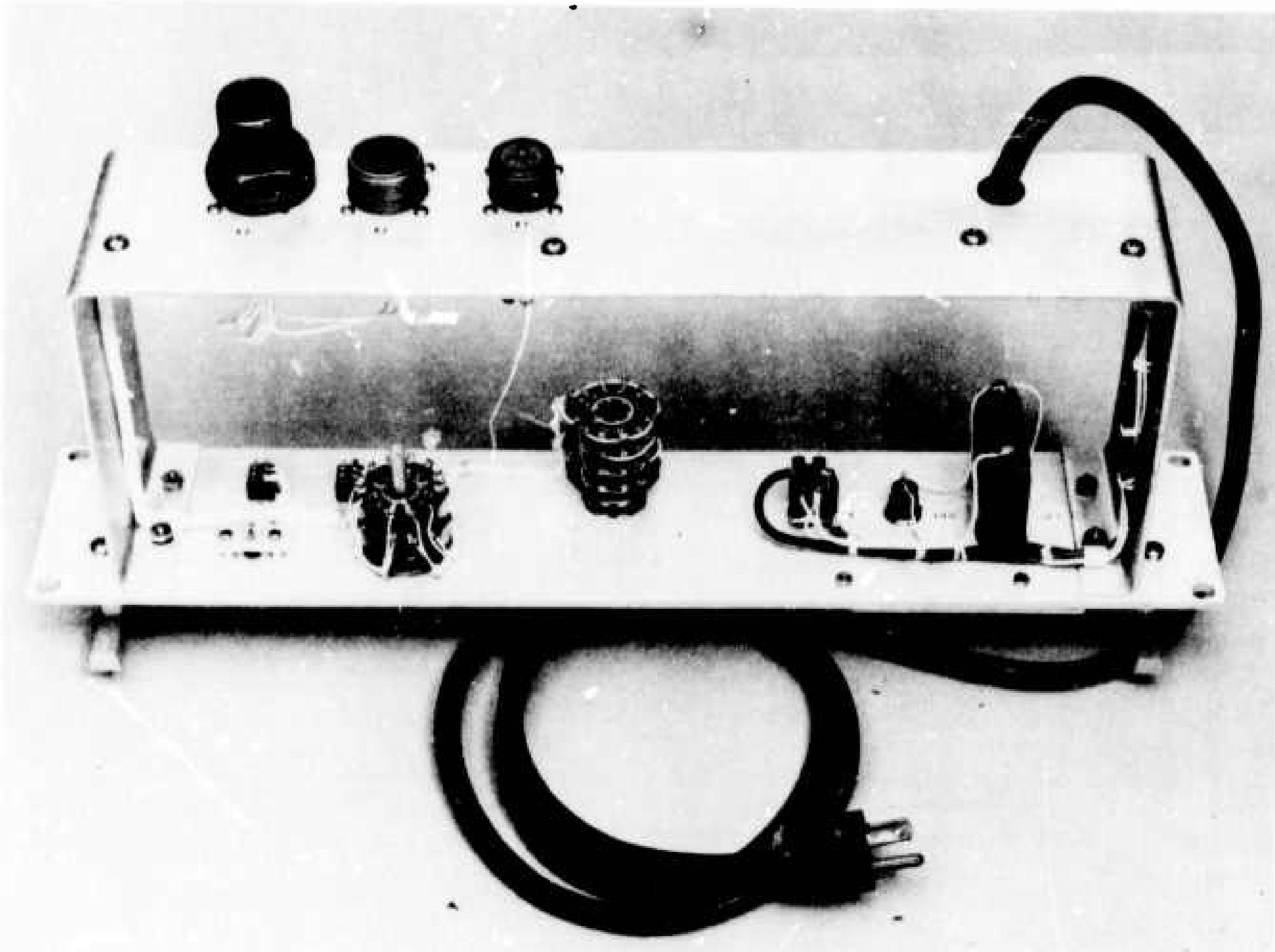


A16 - POWER CONTROL

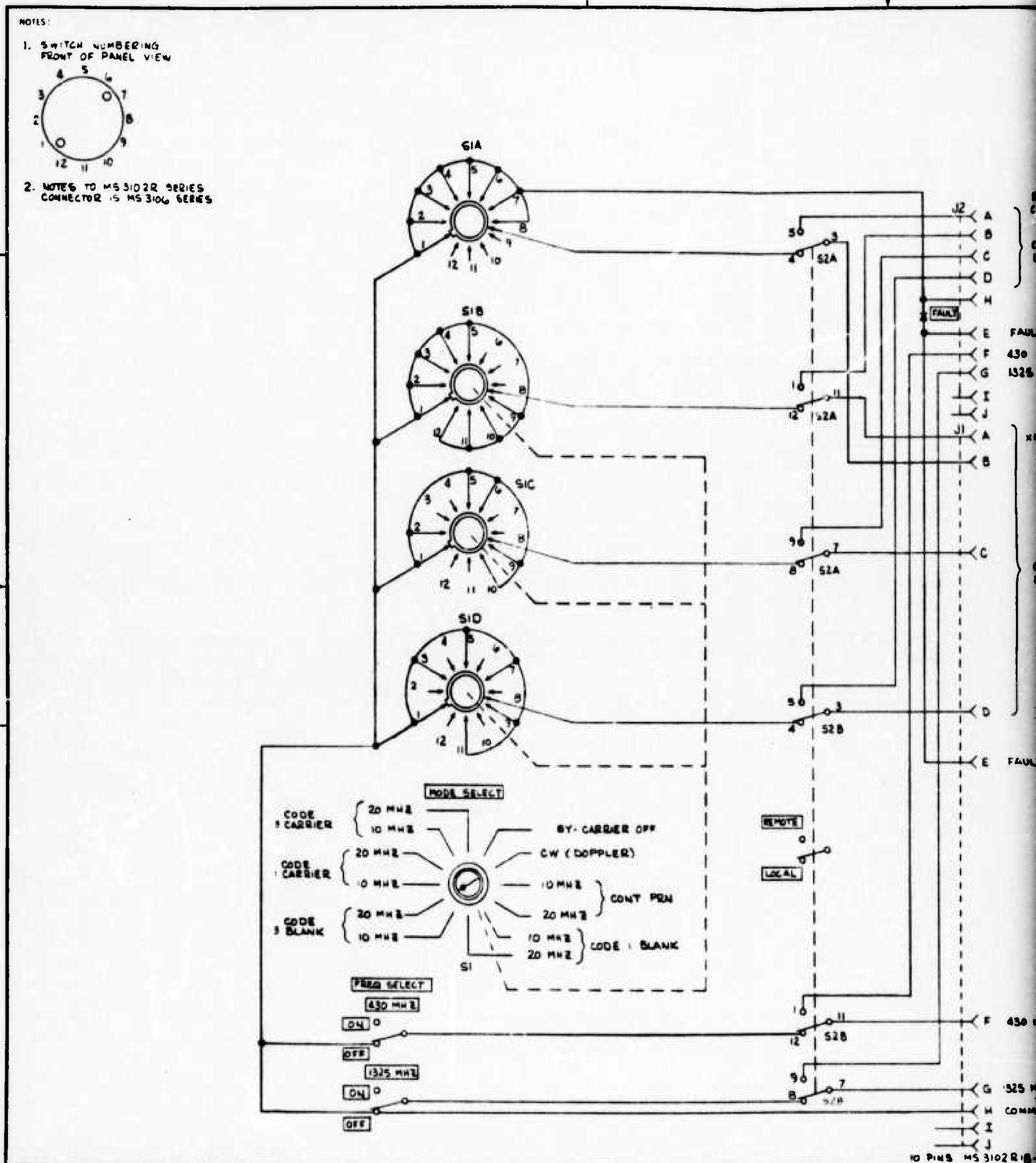

NOTES:
1. K1 AND K2 BOTTOM VIEW
COLOR BEAD
CPN 974 1084 010
2. ALL RESISTORS VALUES ARE IN OHMS
+24 VDC
430 MHZ PA CONTROL
+24 VDC FOR 1325
+5V
1325 MHZ PA CONTROL
-20 V
LOSS OF LOCK FAULT SUMMARY LINE
GND
TO 430 MHZ PA
TO 1325 MHZ PA
TO PA CONTROL
10 FAULT
-001
PARTS LIST
COLLINS RADIO COMPANY
SCHEMATIC DIAGRAM
PREP J HURLEY
13499
627-9641



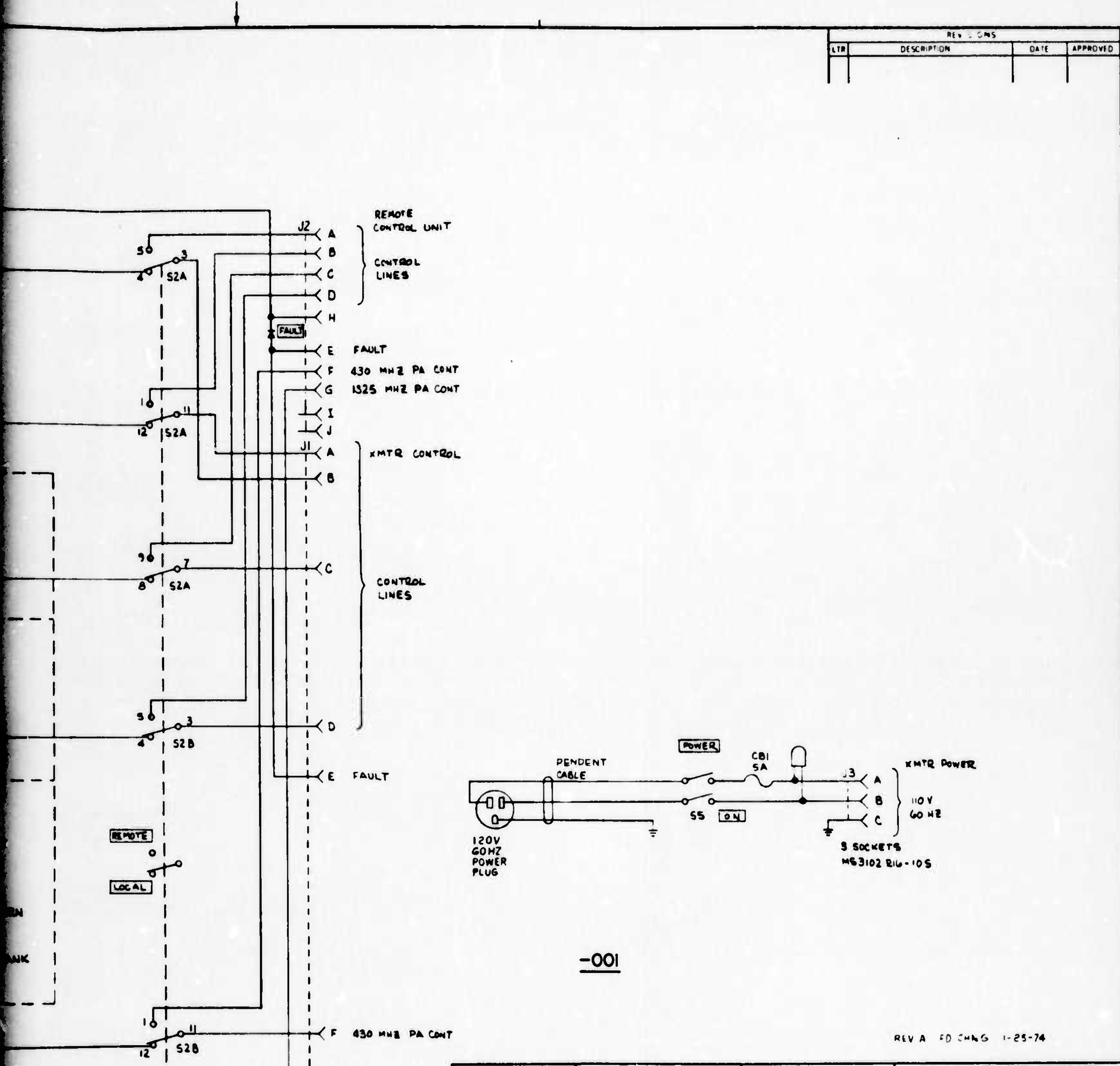
Front Panel



Assembly


NOTES:
1. SWITCH NUMBERING FRONT OF PANEL VIEW
2. NOTES TO MS 3102R SERIES CONNECTOR IS MS 3106 SERIES
S1A
S1B
S1C
S1D
S2A
S2B
J2
J1
FAULT
MODE SELECT
CODE & CARRIER
20 MHZ
10 MHZ
BY- CARRIER OFF
CW (DOPPLER)
CONT PRN
CODE & BLANK
S1
REMOTE
LOCAL
FREQ SELECT
430 MHZ
1325 MHZ
ON
OFF
COMM
10 PINS MS 3102R18-
NEXT ASSY
TYPE NO.

A

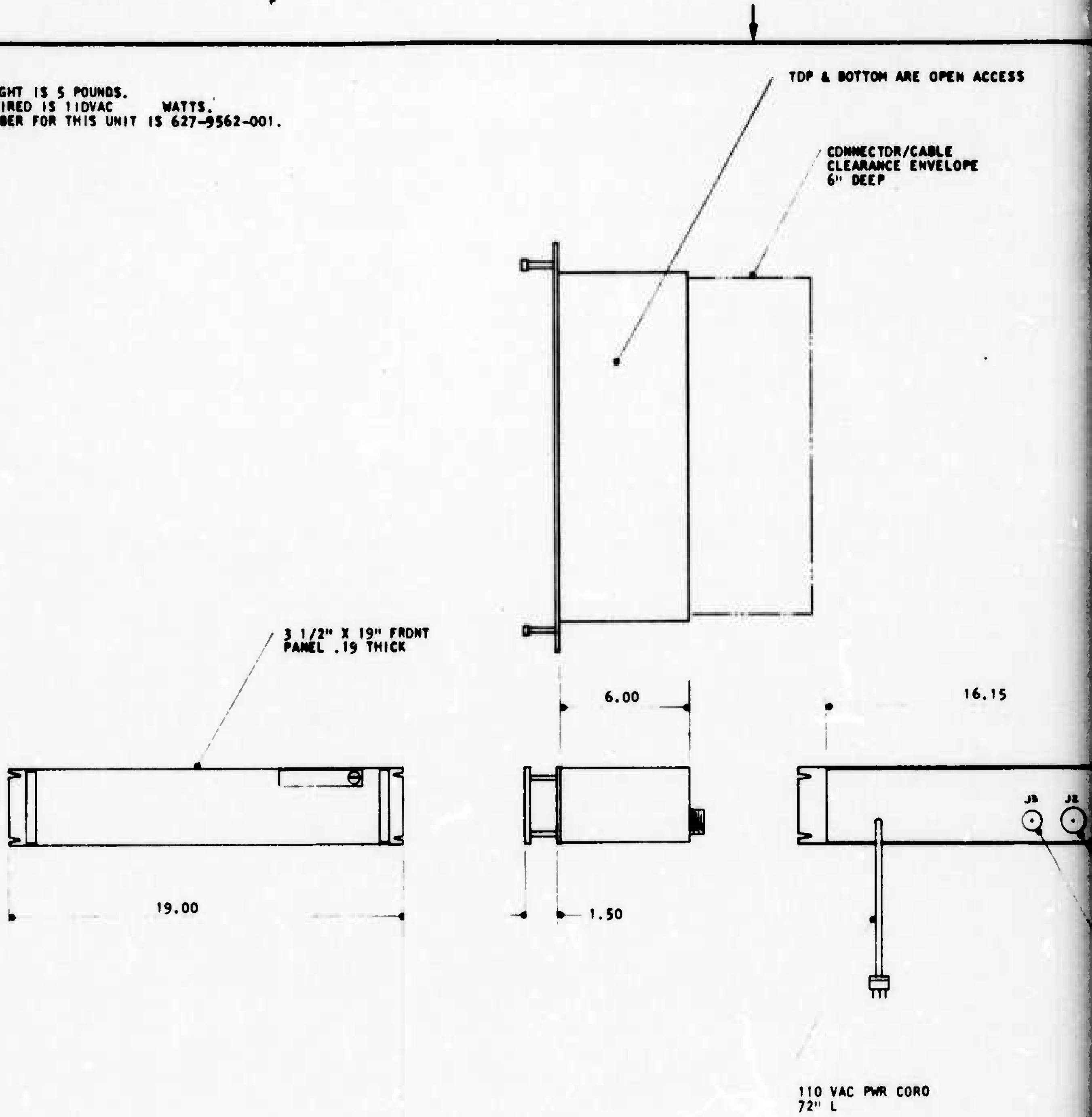


MATERIAL	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; DEC DIM.: .XX ±.02, .XXX ±.008 HOLE DIAMETERS UNDER .251 DIA +.005 -.004; .251 TO .500 DIA +.006 -.005; OVER .500 DIA +.008 -.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .025 DIA	CONTRACT NO	COLLINS RADIO COMPANY
FINISH		PREP J. MURLEY 1-3-73	SCHEMATIC DIAGRAM XMTR CONTROL PANEL PACKET RADIO TEST SET
		CHK	
		APVD	SIZE D CODE IDENT 13499 DWG NO 627-9587

B

NOTES:

1. UNIT WEIGHT IS 5 POUNDS.
2. PWR REQUIRED IS 110VAC WATTS.
3. PART NUMBER FOR THIS UNIT IS 627-9562-001.



QTY	ITEM NO.	PART O IDENTIFYING
	DASH NO	

MATERIAL

N/A

FINISH

N/A

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008

HOLE DIAMETERS:
UNDER .251 DIA = +.005-.005
.251 TO .500 DIA = +.006-.005
OVER .500 DIA = +.008-.005

ANGLES: ±1.0°

ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA

PART SHALL COMPLY TO 580-5400-001

CONTRA

PREP

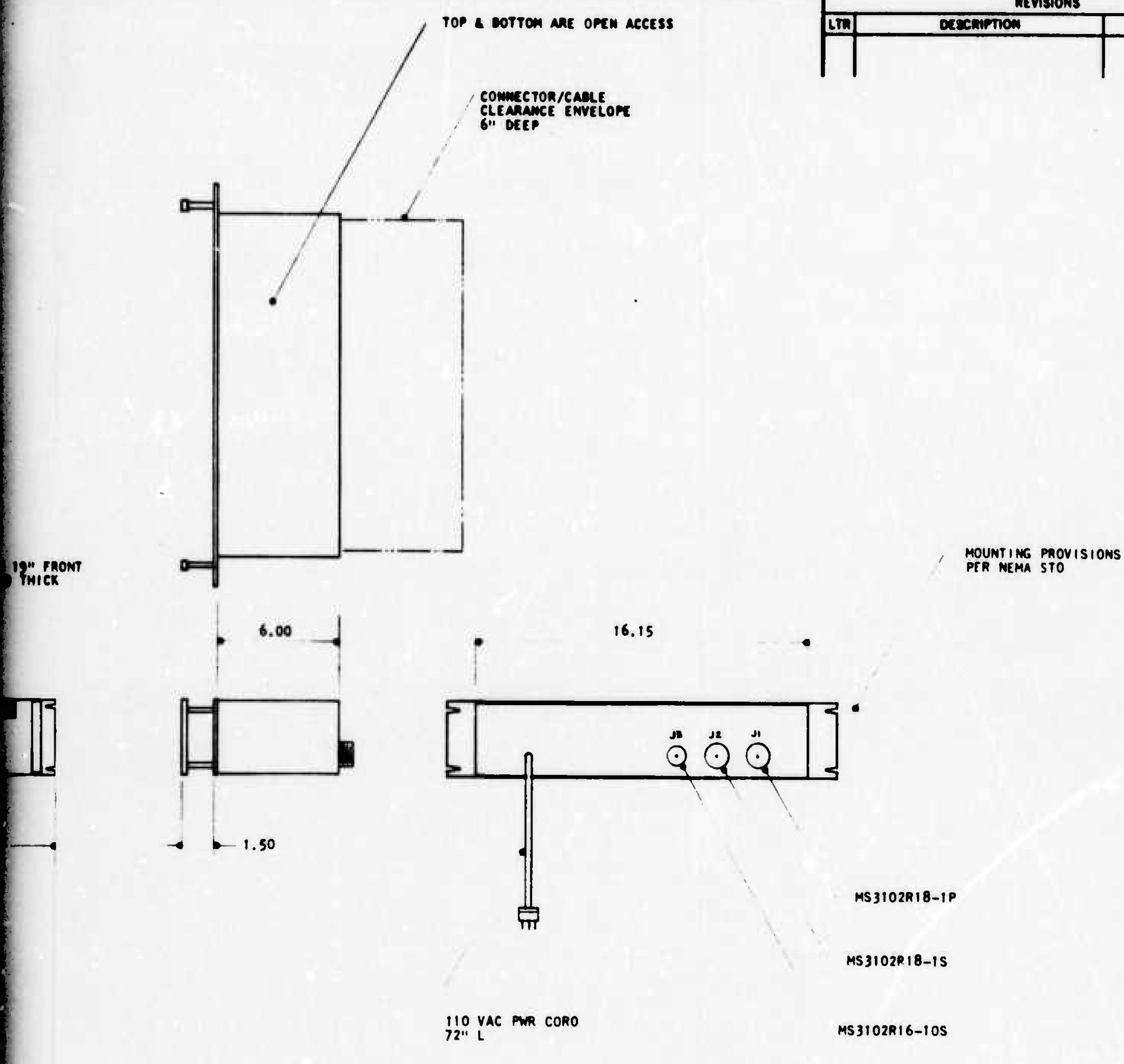
CHK

APVD

NEXT ASSY: TYPE NO:

A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

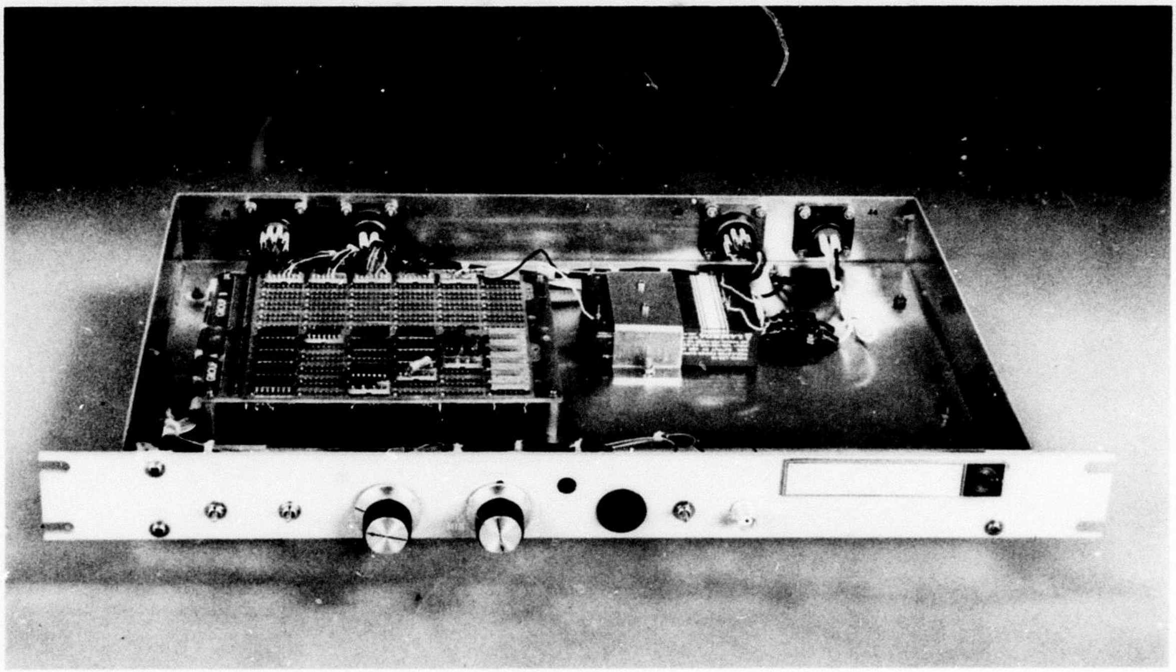


QTY	ITEM NO.	PART OR IDENTIFYING NO	NAME	DESCRIPTION	UM	MN	ALTN PREF
	DASH NO	PARTS LIST					

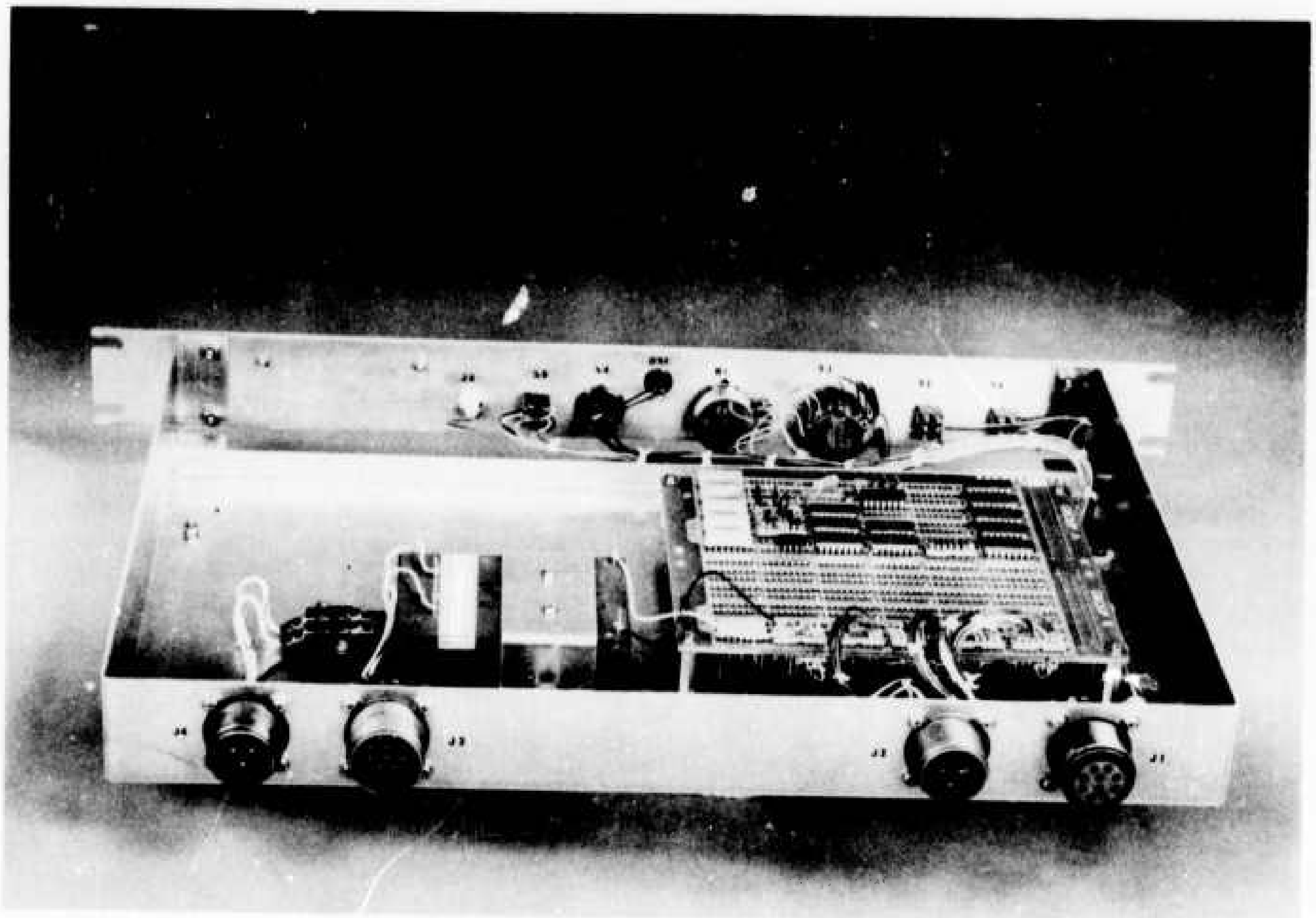
MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO.	COLLINS RADIO COMPANY
N/A	DIMENSIONS ARE IN INCHES; TOL ON DEC DIM.: .XX = ±.02, .XXX = ±.008 HOLE DIAMETERS: UNDER .251 DIA = +.005-.005 .251 TO .500 DIA = +.006-.005 OVER .500 DIA = +.008-.005 ANGLES: ±1.0° ECCENTRICITY BETWEEN DIA ON AN AXIS NOT TO EXCEED .010 DIA	PREP D. DELFELD 11/16/73 CHK APVD R A K...l	DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA TRANSMITTER CONTROL-OUTLINE & INSTALLATION, PACKET RADIO TEST SET
FINISH N/A	PART SHALL COMPLY TO 580-5400-001		SIZE C CODE IDENT 13499 DWG NO 627-9571 SCALE 1/4 SHEET

FRO ☐ NFP ☐ REL ☐ REV_ _ TC_ _ CR_ NB_ DL_ TO_

B

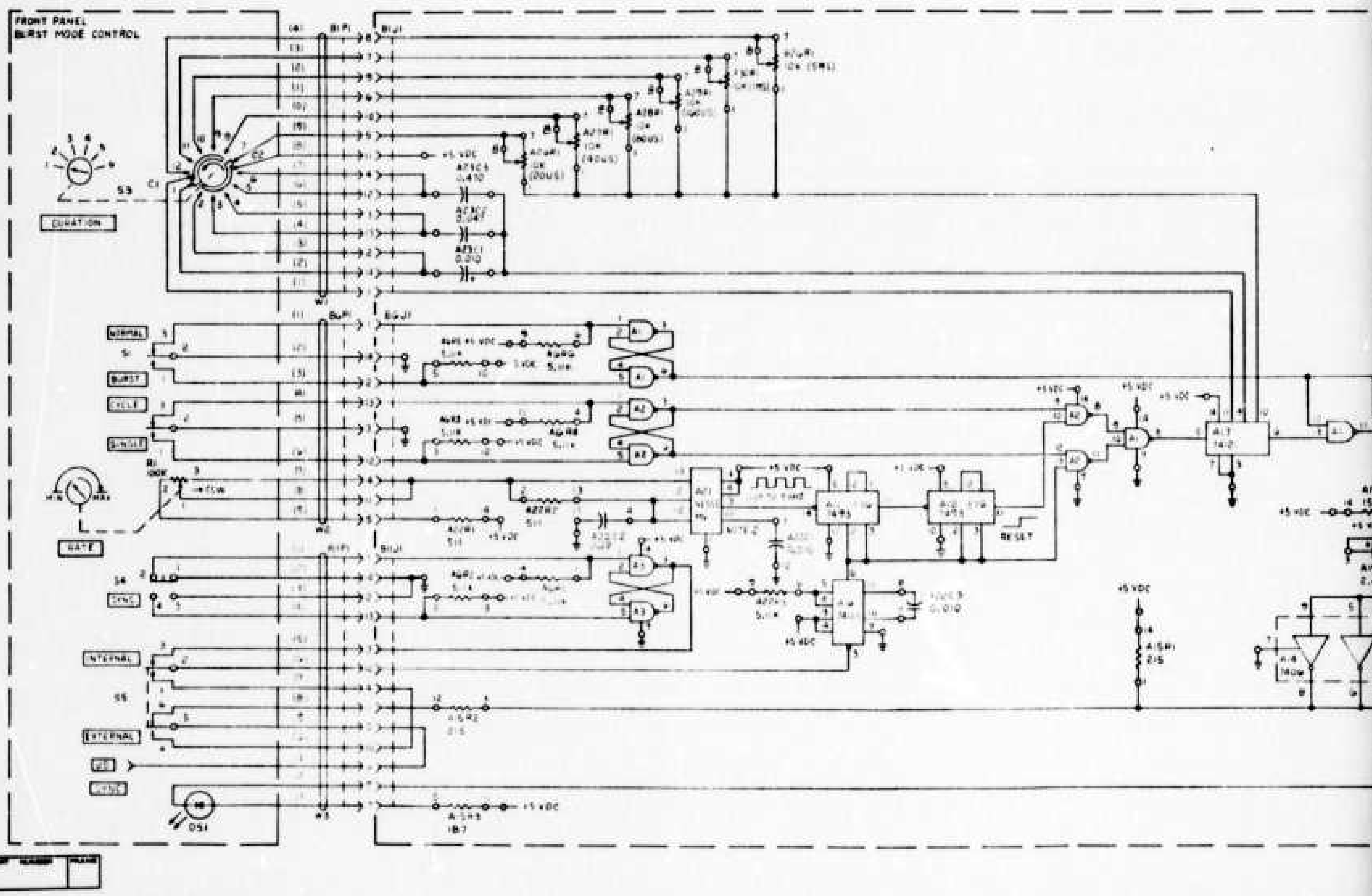


Front Panel

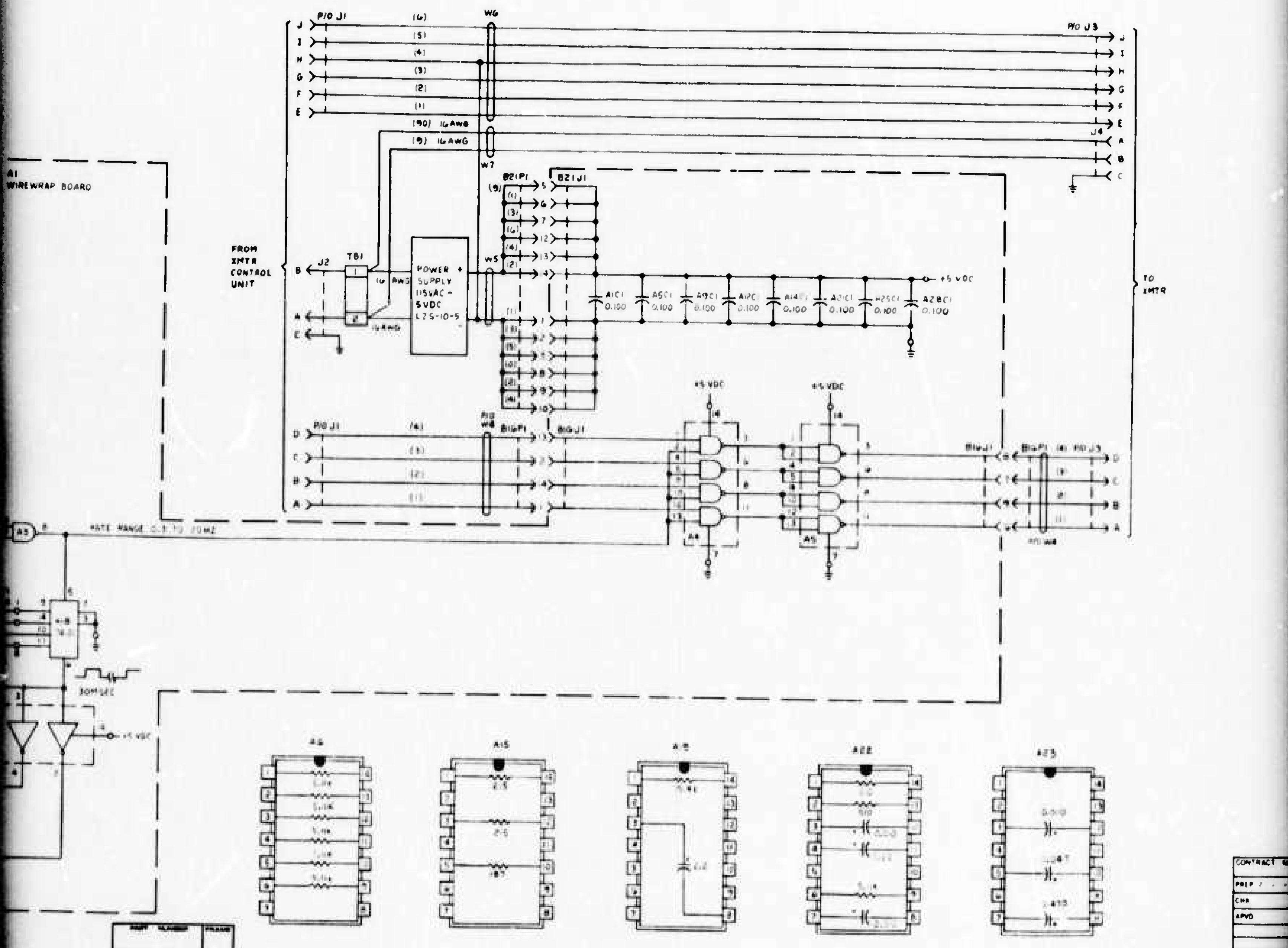


Assembly

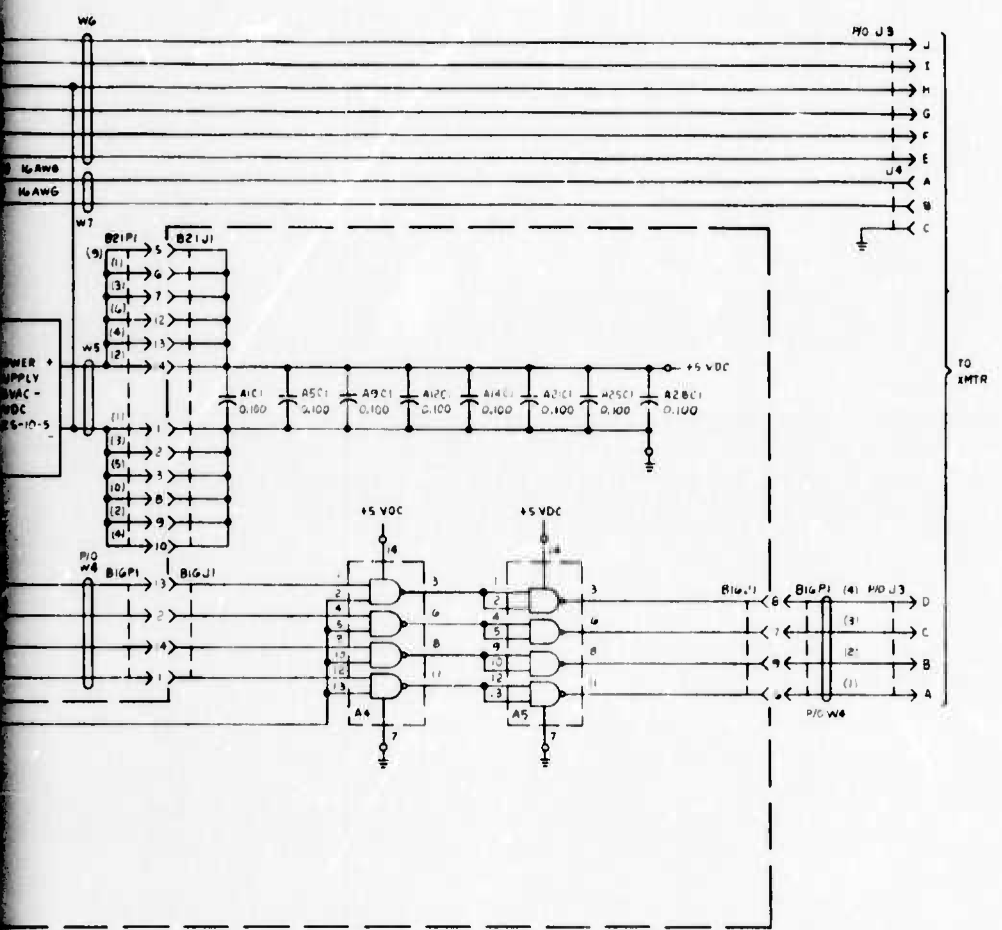
NOTES:
1. UNLESS OTHERWISE SPECIFIED
   ALL RESSISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROFARADS
   ALL WIRE #22 TEFLON, WITH COLOR CODE IN ( )
2. THE 555 TIMER IS MOUNTED AT POSITION A21 WITH PIN 1 OF THE COMPONENTS MATING WITH PIN 1 OF THE BOARD.
3. ALL AUDIO CONNECTIONS FROM BOARD A1 ARE LOCATED IN SECTION B.
4. CIRCUIT CARD GND FLOATING WITH RESPECT TO CHASSIS GND.

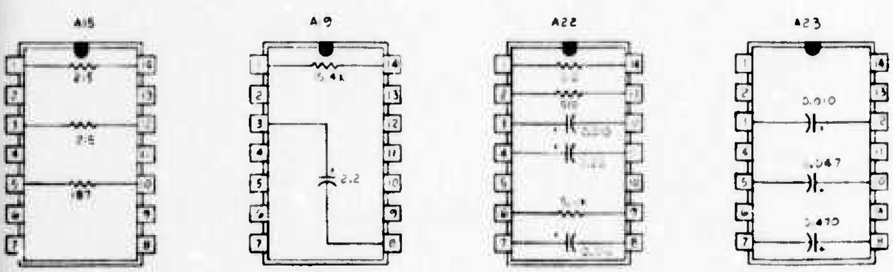


A


A1
WIREWRAP BOARD
FROM
XMTR
CONTROL
UNIT
TO
XMTR
P/O J1
P/O J3
W6
W7
W5
J2
J4
TB1
B21P1
B21J1
B16P1
B16J1
POWER
SUPPLY
115VAC-
5VDC
LZS-10-5
+5 VDC
16 AWG
A4
A5
30MSEC
A6
A15
A22
A23
CONTRACT
PREP
CHK
APVD

B



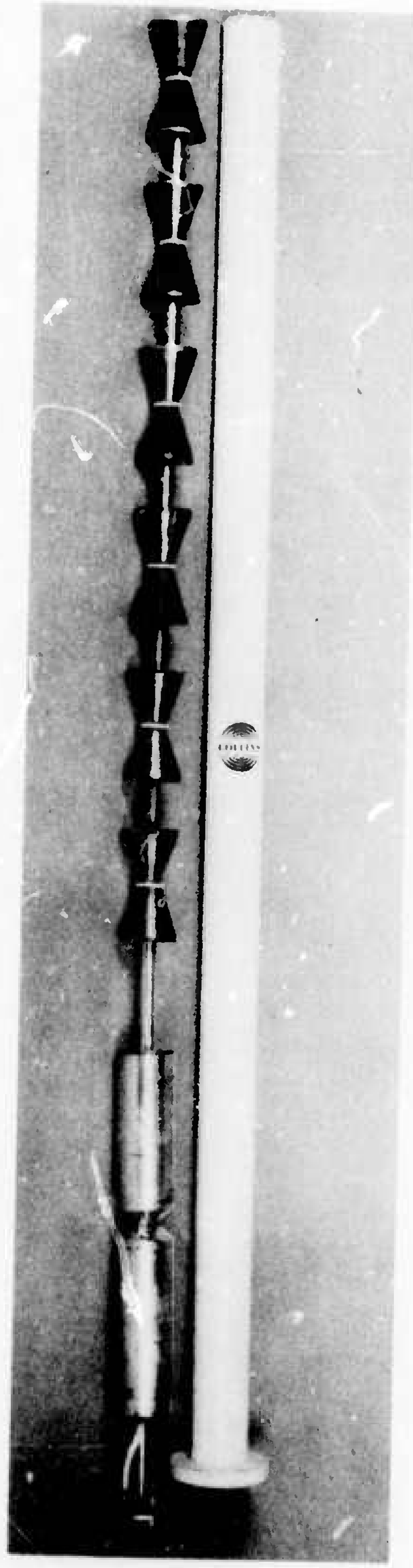


REVISIONS				
	LTR	DESCRIPTION	DATE	APPROVED

PUBLICATIONS DRAWING

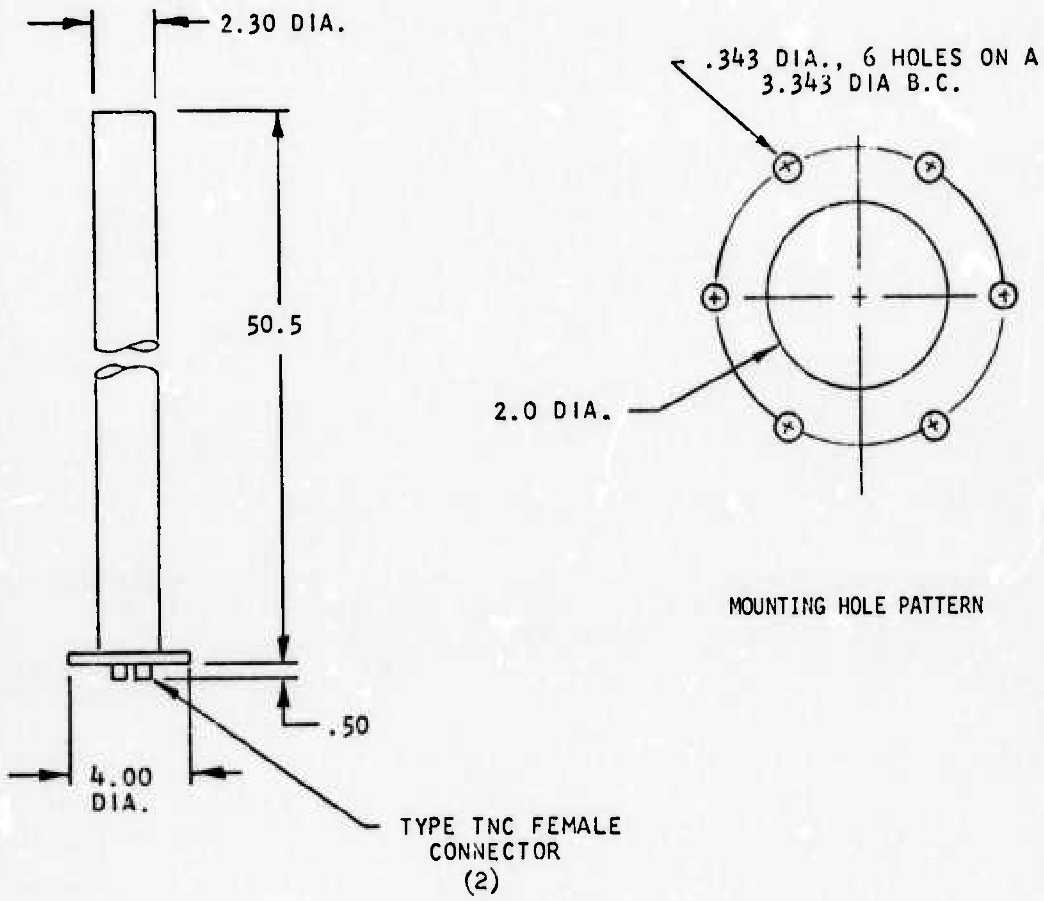
CONTRACT NO	COLLINS RADIO COMPANY
PREP	
CHK	
APVD	SIZE D · CODE IDENT 13499 · DWG NO 63-1554-001
	SCALE · SHEET

C



Assembly View

Assembly View



SPECIFICATION CONTROL DRAWING

COLLINS RADIO COMPANY

DALLAS, TEX NEWPORT BEACH, CALIF CEDAR RAPIDS, IA

OUTLINE AND INSTALLATION
HIGH GAIN - DUAL BAND ANTENNA

PREP
CHK
APVD

A

631-9568-001

2111

074 5225 002 (REV 2 70)

B.1 INTRODUCTION

Although the test set has been designed to allow the user to adjust many levels for specific tests, two alignment procedures are suggested.

a. IF channel gain and receiver signal meter calibration

b. Doppler test setup

The if. channel gain adjustments normalize all signals (430 MHz RCV, 1370 MHz RCV, wideband or narrowband) to a constant level for monitoring or processing.

The front panel receive signal strength meter operates on the agc voltage and is only usable when in the automatic agc mode. It provides a gross signal strength indication to the operator.

Doppler tests may be made in open loop or phase-lock mode. The frequency standards in the receiver and transmitter have sufficiently low drift rate to allow short period measurements, provided the oscillators are carefully adjusted for synchronism. A very long loop time constant (minutes) is employed to avoid tracking the low rate doppler expected in tests in an urban environment.

The adjustment procedures reference 1325 MHz which is engraved on the front panel. The test set has been converted to 1370 MHz and the procedures are still valid.

B.2 ADJUSTMENT PROCEDURE OF IF CHANNEL GAIN AND RCVR SIG METER CALIBRATION

a. Terminate (50 ohms) both antenna input ports.

b. Set both if. channel gain controls for max gain (full CW)

c. Select

Channel	430 MHz
BW	WB
IF agc	Auto
Threshold Det	IF
Doppler Test	Disable

d. Adjust automatic agc gain level for desired output (put on top of A1)

e. Adjust the offset control (top of A1 out house) for a reading of 0.2 mA on the RCVR SIG meter.

f. Select the 1325 channel. Note the RCVR SIG meter reading.

g. Adjust the channel with the highest MA reading on the RCVR SIG meter to be equal to the other channel.

h. Select the NB mode and adjust the NB gain control (located toward the front of module A3A1) for a RCVR SIG meter reading equal to that obtained in step g.

i. Readjust the offset control on the top of A1 for a reading of 0 mA on the RCVR SIG meter.

j. Recheck the balance of the NB/WB/430/1325 switch positions.

k. Apply a 430 or 1325 MHz CW signal at -30 dBm to the appropriate antenna port.

l. Adjust the RCVR SIG meter drive control (located on a bracket behind the meter) for a reading of 1.0 mA.

m. Reterminate the antenna port and readjust the offset control for 0 mA (if required).

n. Repeat steps j., k., and l. until steps k. and l. are correct without readjustment.

o. Generate a meter calibration curve.

B.3 DOPPLER TEST SETUP

The phase lock loop to synchronize the receiver to the transmitter is designed to have a very long time constant so that it will not track the doppler shifts at the low doppler rates expected during the tests. The frequency standard also has sufficient stability to allow short-period doppler measurements to be made open loop, provided the frequency is precisely adjusted just prior to the test. Adjustment of the receiver frequency standard to proper phase lock condition is somewhat tedious due to the long time constant. The following procedure is recommended to reduce the time required for this adjustment.

a. Adjustments for transmitter mode and receiver modes follow:

1. Transmitter Mode — CW
2. Receiver Modes

Channel Select	430 MHz or 1325 MHz
BW	NB
Doppler Test	Disable
IF AGC AMPL	Auto
Adjustment	Set 10 MHz FREQ CTL for zero beat frequency as observed on the I&Q meters. This frequency control does not have the doppler time constant delays and zero beat can be obtained in a short period of trial & error adjustment. The I meter should be at zero and the Q meter at -5 volts. The frequency

standard correction voltage can be recorded (to the nearest millivolt) from the front panel test point located below the I&Q meters to minimize alignment in the doppler test mode.

b. If doppler tests are to be made with the receiver locked to the transmitter through the slow loop, proceed to adjust the system as follows:

In the doppler test mode, use the same receiver switch modes as step a. except the doppler test is "ON". Place the ØLL switch to fast. (The loop time constant is still relatively slow in the fast position.) Adjust the 10 MHz Ø CTL until the frequency standard correction voltage is the same as that determined in step a.

Allow 30 seconds or more for the doppler test unit to settle to the vicinity of null. Fine adjust the phase control for the I meter to be 0 and the Q meter to be -5V.

Set the ØLL T_c switch to slow and slowly readjust the phase control for the proper I&Q meter readings if necessary.

Note: If in the field with doppler affects being displayed, the I&Q meters will never stabilize at the 0 volts and -5-volt positions.

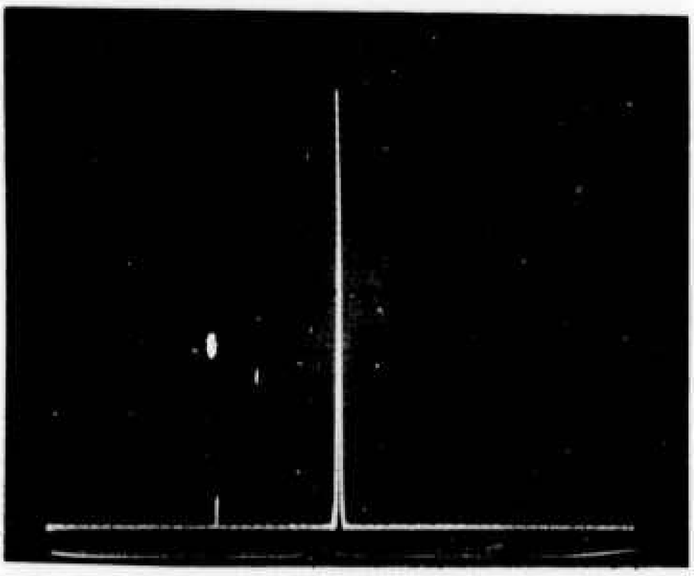
C.1 INTRODUCTION

The data in this appendix is presented without narrative and is considered self-explanatory. The index defines the order of presentation for quick reference. Note that the data reflects the performance at 1325 MHz and was not repeated at 1370 MHz. The performance at 1370 MHz is the same as the data presented for 1325 MHz.

Transmitter Spectrums

1325 MHz

Mode CW



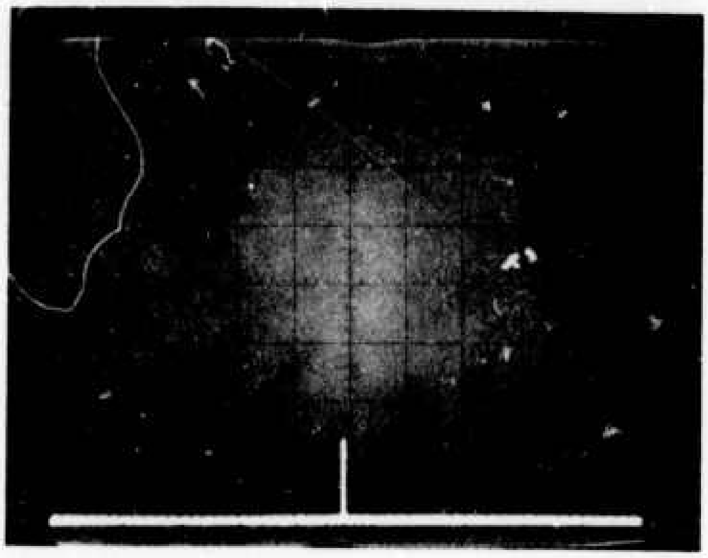
XMTR

30 DB

SPECTRUM ANALYZER

LOG REF	+10 DBM
BW	300 KHZ
FC	1325 MHZ
SCAN	20 MHZ/DIV

Standby Mode



XMTR

30 DB

SPECTRUM ANALYZER

LOG REF	+10 DBM
BW	300 KHZ
FC	1325 MHZ
SCAN	20 MHZ/DIV

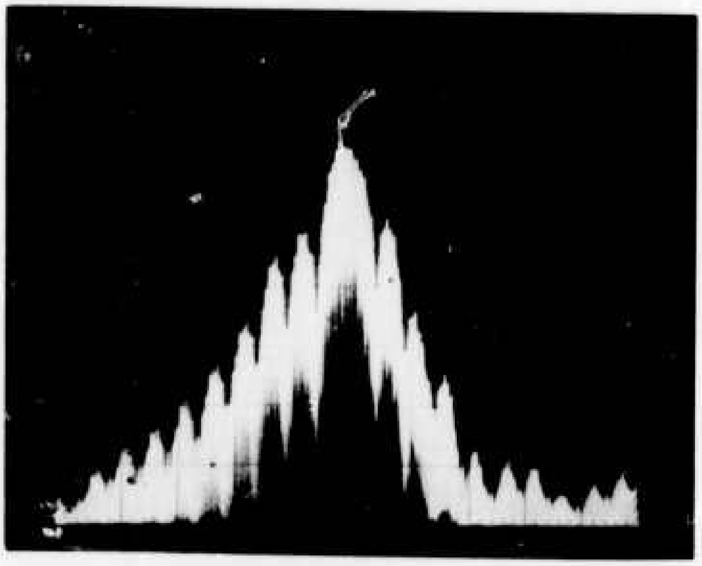
NOTE

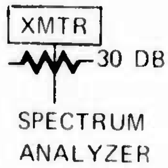
With PA power off, signal is <-80 dBm.

Transmitter Spectrums (Cont)

1325 MHz

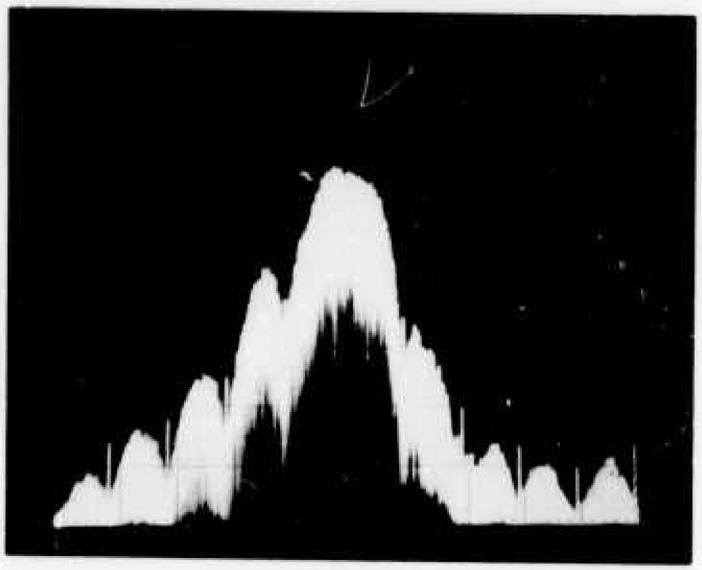
10 M-Chip Continuous Code Mode

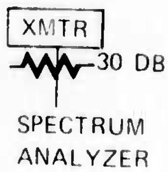




LOG REF	+10 DBM
BW	300 KHZ
FC	1325 MHZ (APPROX)
SCAN	20 MHZ/DIV

20 M-Chip Continuous Code Mode



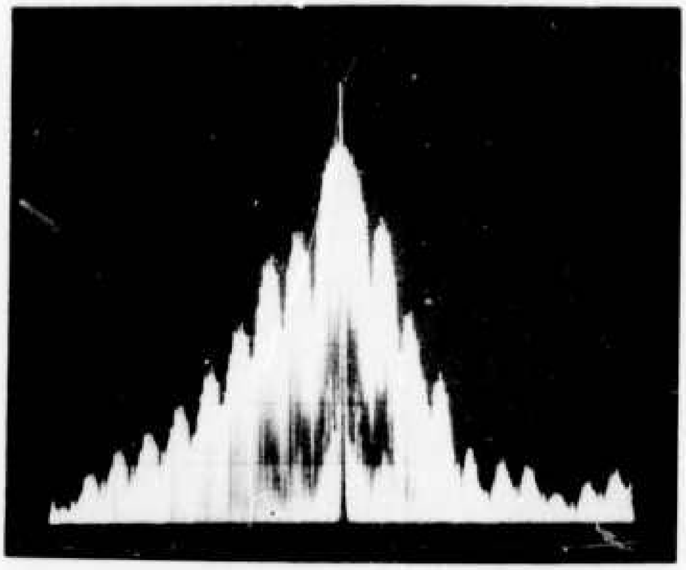


LOG REF	+10 DBM
BW	300 KHZ
FC	1325 MHZ (APPROX)
SCAN	20 MHZ/DIV

Transmitter Spectrums (Cont)

1325 MHz

10 M-Chip Rate 1 Code/1 Carrier Mode



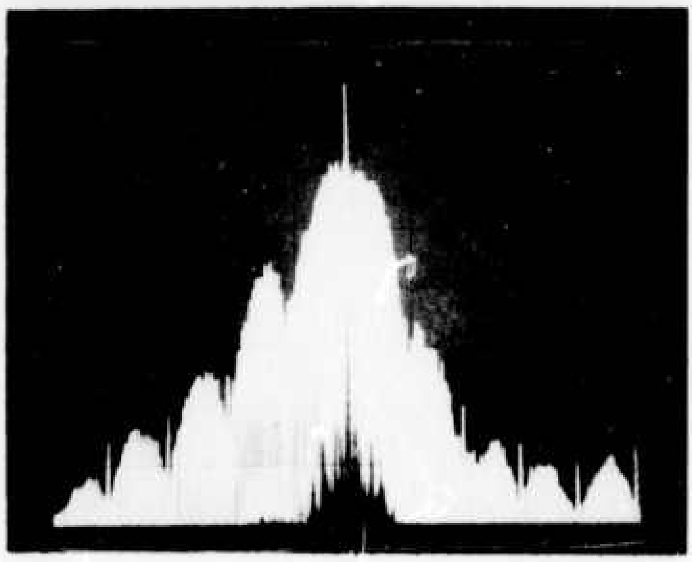
XMTR

30 DB

SPECTRUM ANALYZER

LOG REF +10 DBM
BW 300 KHZ
FC 1325 MHZ
SCAN 20 MHZ/DIV

20 M-Chip Rate 1 Code/1 Carrier



XMTR

30 DB

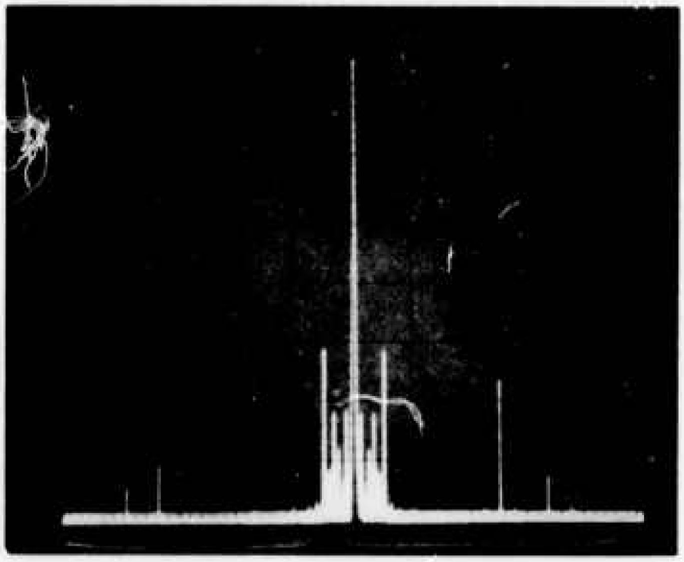
SPECTRUM ANALYZER

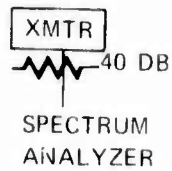
LOG REF +10 DBM
BW 300 KHZ
FC 1325 MHZ
SCAN 20 MHZ/DIV

Transmitter Spectrums

430 MHz

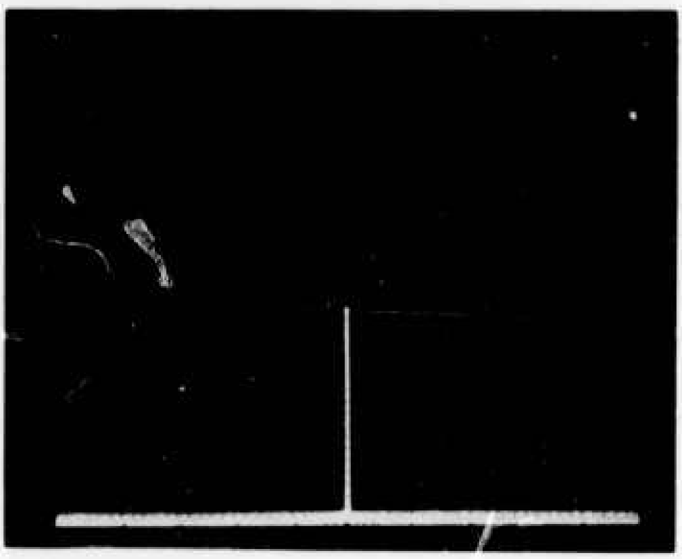
CW Mode

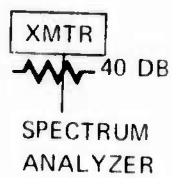




LOG REF	+10 DBM
BW	300 KHZ
FC	430 MHZ
SCAN	20 MHZ/DIV

Standby Mode



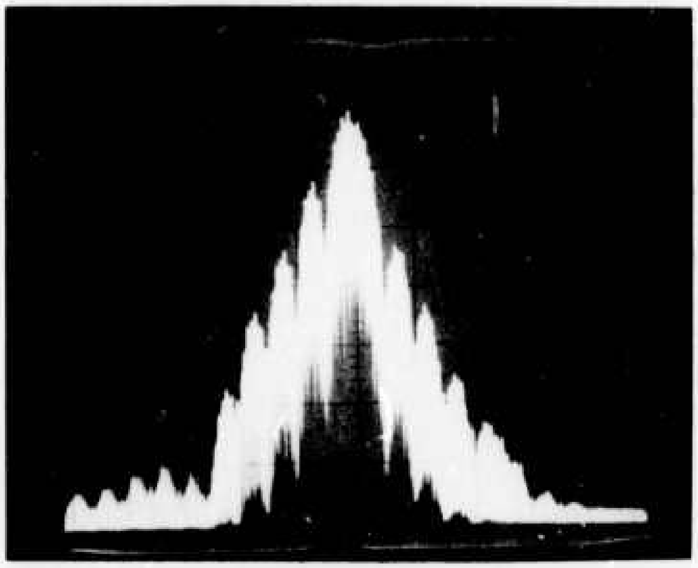


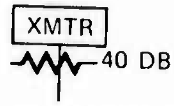
LOG REF	+10 DBM
BW	300 KHZ
FC	430 MHZ
SCAN	20 MHZ/DIV

NOTE

With PA power off, signal is < -80 dBm.

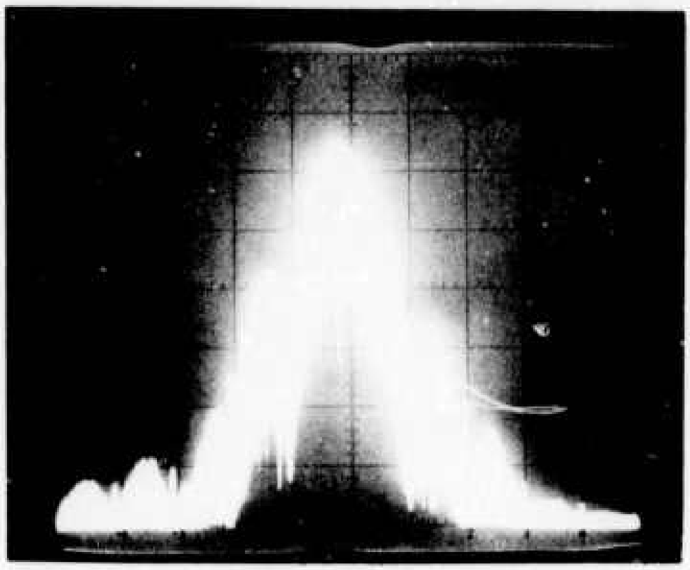
10 M-Chip Rate Continuous Code

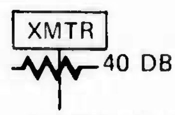




LOG REF +10 DBM
BW 300 KHZ
FC 430 MHZ
SCAN 20 MHZ/DIV

20 M-Chip Rate Continuous Code



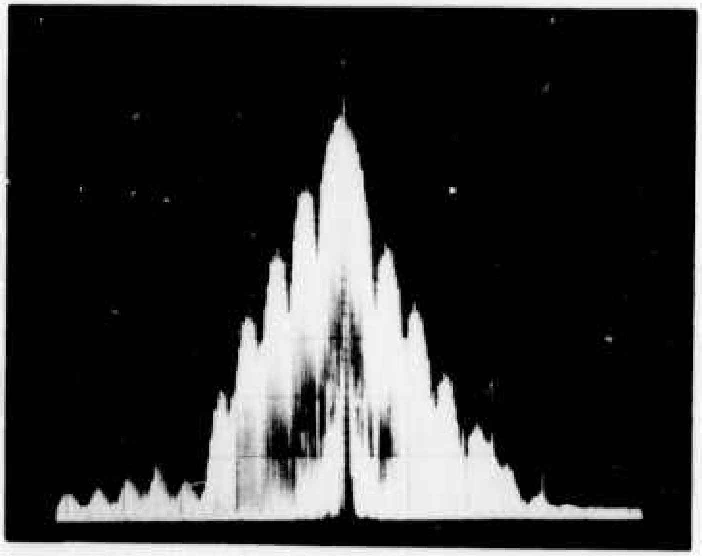


LOG REF +10 DBM
BW 300 KHZ
FC 430 KHZ
SCAN 20 MHZ/DIV

Transmitter Spectrums (Cont)

430 MHz

10 M-Chip Rate 1 Code/1 Carrier

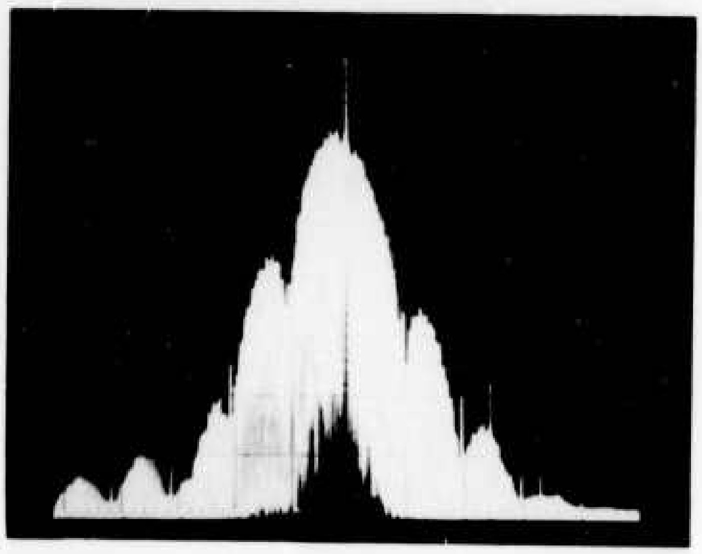


XMTR

SPECTRUM
ANALYZER

LOG REF	+10 DBM
BW	300 KHZ
FC	430 MHZ
SCAN	20 MHZ/DIV

20 M-Chip Rate 1 Code/1 Carrier



XMTR

SPECTRUM
ANALYZER

LOG REF	+10 DBM
BW	300 KHZ
FC	430 MHZ
SCAN	20 MHZ/DIV

Received Signals

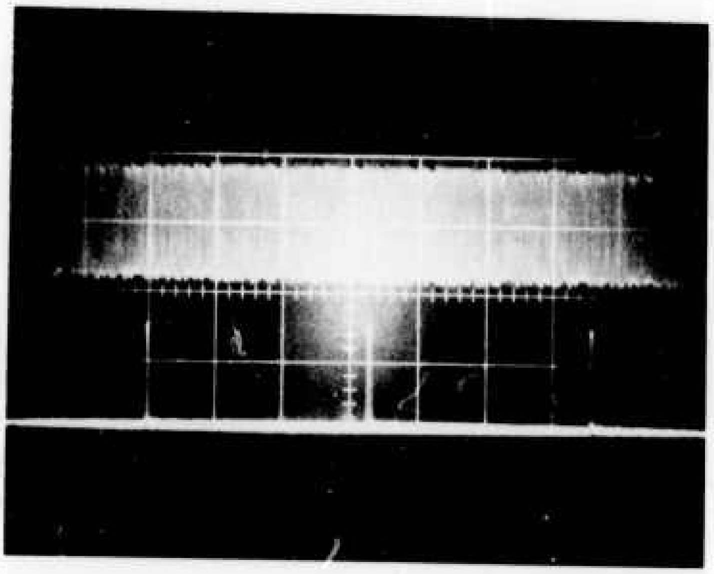
The following apply for this series of pictures;

- Top Trace - rf if. measured at threshold detector output (0.5V/cm)
- Bottom Trace - envelope detector output (1.0V/cm)

(Measurements taken on Tektronix's 585A.)

- Horizontal Scale 4 μs/cm
- Transmitter rf attn'd & connected to receiver
- AGC in manual gain.

10 M-Chip Rate



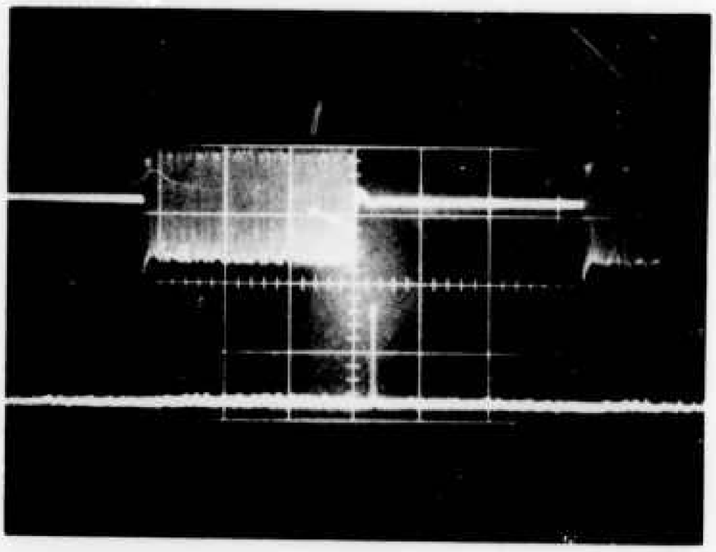
CONTINUOUS PRN CODE

IF
0.5 V/CM (VERT)

DET
1.0 V/CM (VERT)

Receive Signals

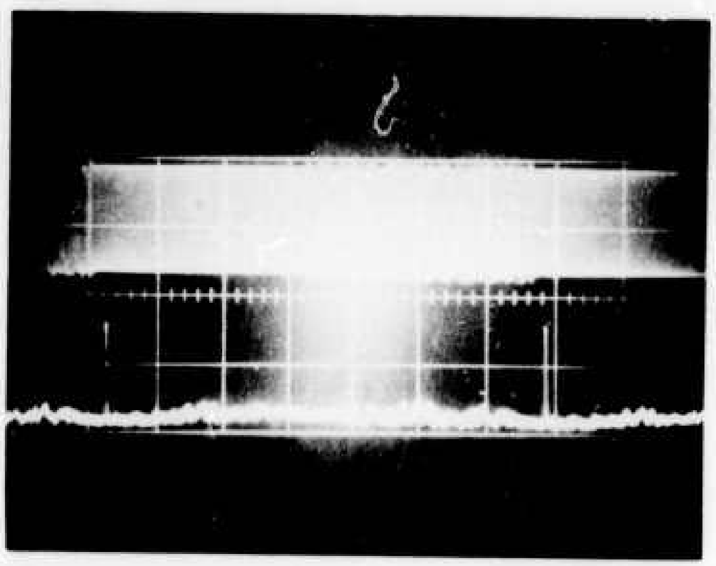
10 M-Chip Rate (Cont)



1 CODE - 1 BLANK

IF

DET



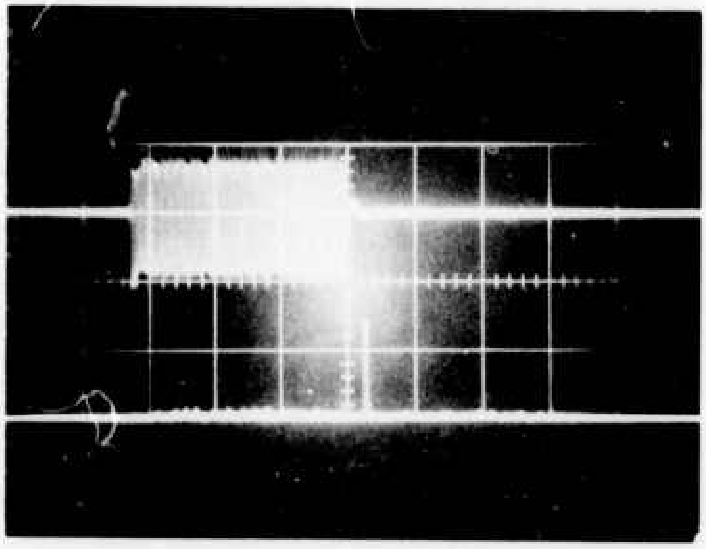
1 CODE - 1 CARRIER

IF

DET

Receive Signals

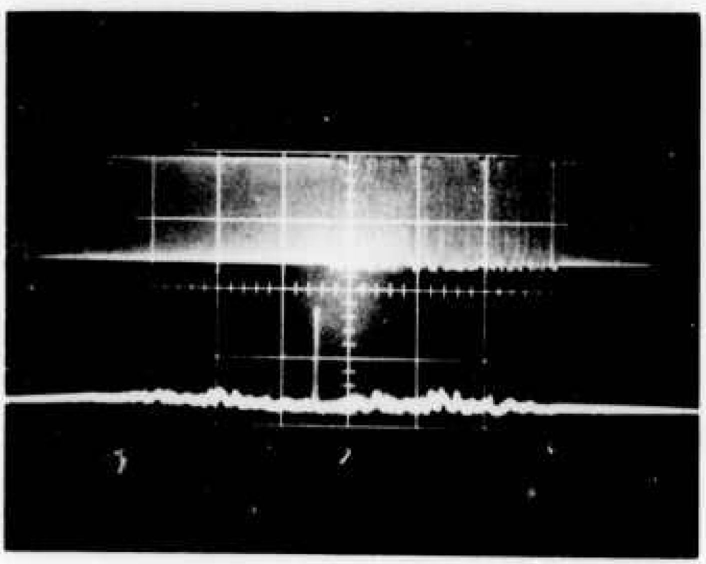
10 M-Chip (Cont)



1 CODE - 3 BLANK

IF

DET



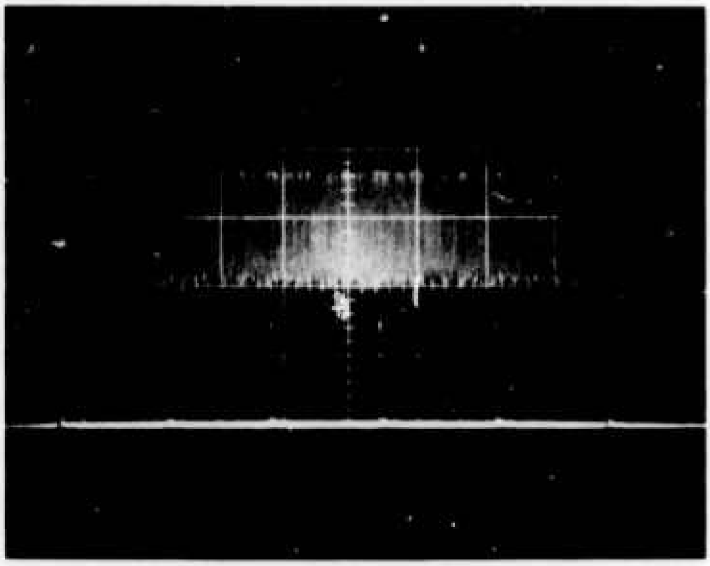
1 CODE - 3 CARRIER

IF

DET

Receive Signals

20 M-Chip



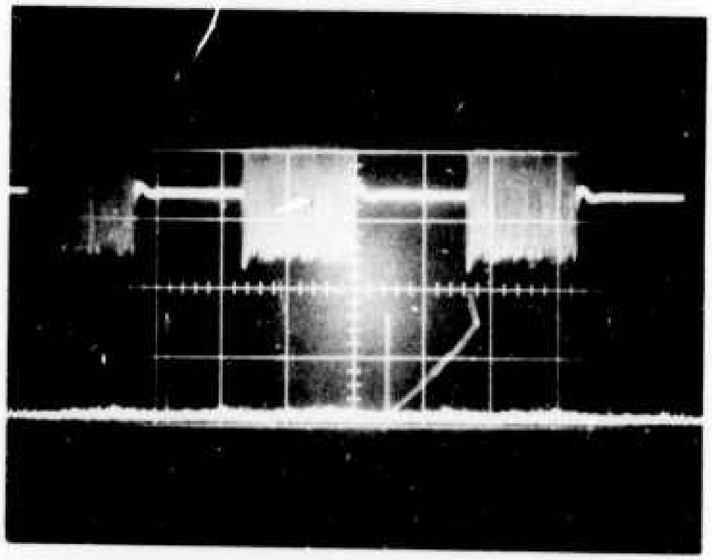
CONTINUOUS CODE

IF

DET

Receive Signals

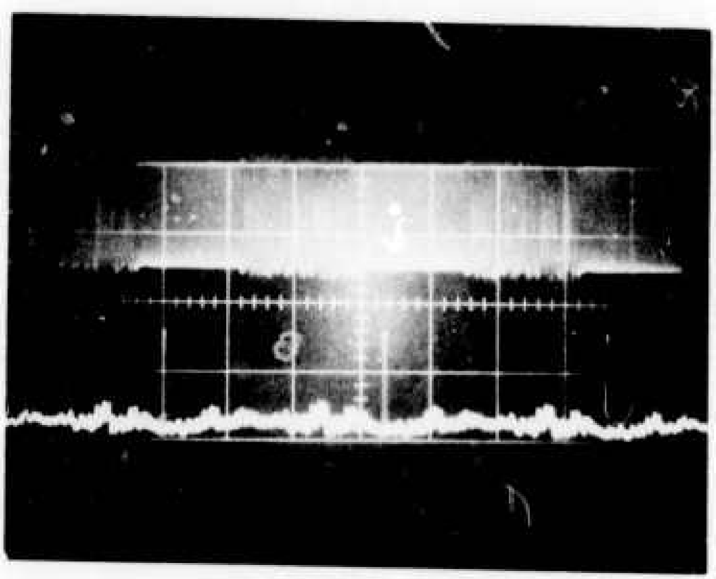
20 M-Chip (Cont)



1 CODE 1 BLANK

IF

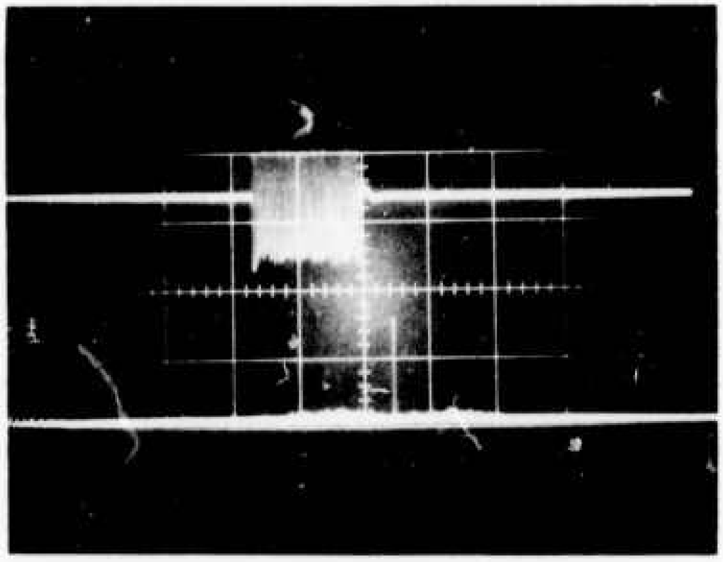
DET



1 CODE 1 CARRIER

IF

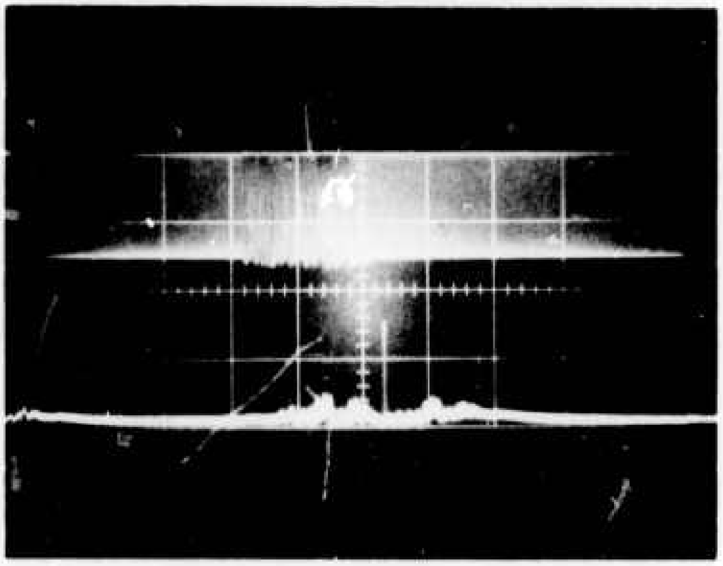
DET



1 CODE - 3 BLANK

IF

DET

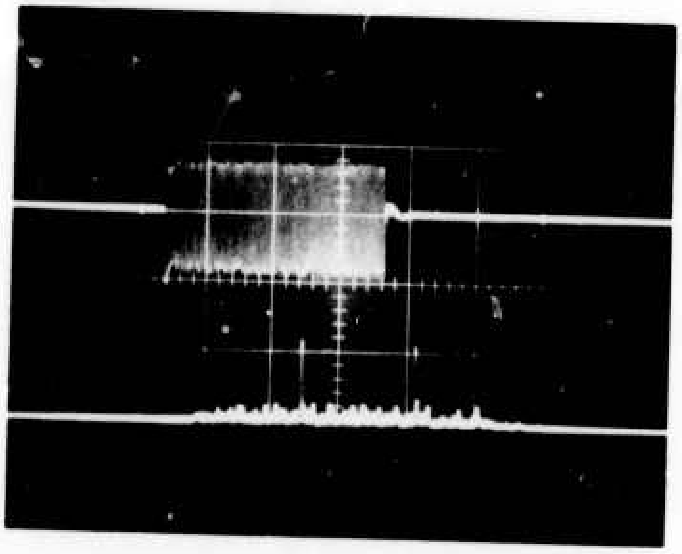


1 CODE - 3 CARRIER

IF

DET

Interaction of SAWD's and Code Rate



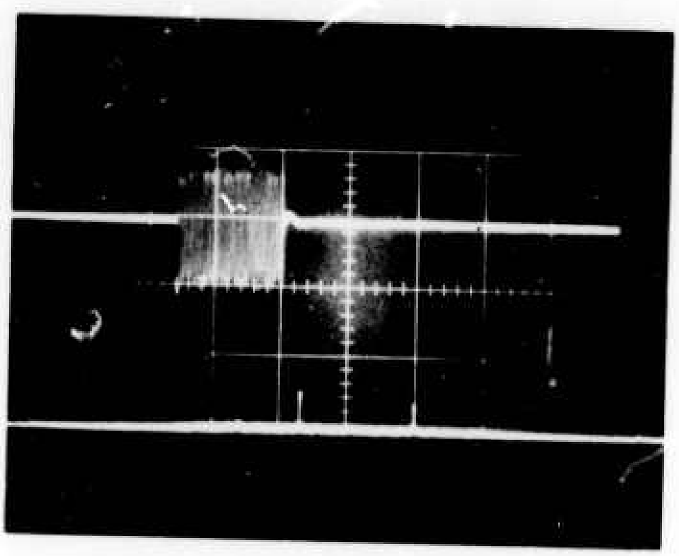
XMTR
10 M CHIP, 1 CODE/3 BLANK

RCVR
20 M CHIP SAWD RCV

TOP TRACE
RCV IF 0.5 V/CM

BOTTOM TRACE 1.0 V/CM

TIME BASE 4 μS/CM



XMTR
20 M CHIP, 1 CODE/3 BLANK

RCVR
10 M CHIP SAWD RCV

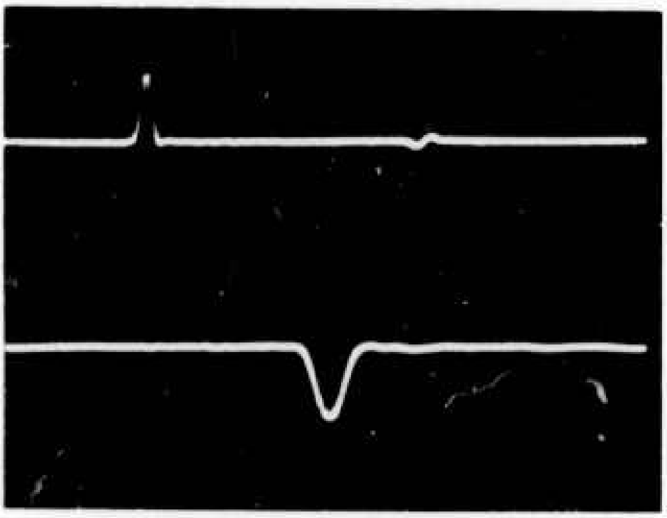
TOP TRACE
RCV IF 0.5 V/CM

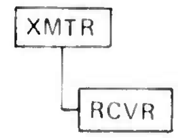
BOTTOM TRACE 1.0 V/CM

TIME BASE 4 μS/CM

Miscellaneous Radio Data

Envelope Detector Response

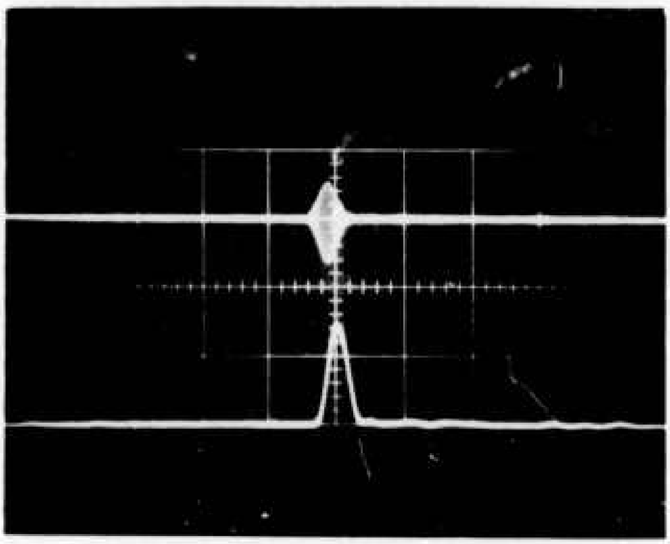




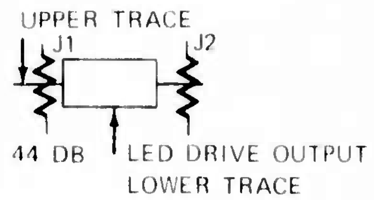
10 M/CHIP 1 CODE 3 BLANK
TOP TRACE SAWD OUTPUT
0.5 V/CM (AT THRESHOLD DET OUTPUT)
BOTTOM TRACE ENVELOP DET OUTPUT 1.0 V/CM

TIME BASE 4 μS/CM

Threshold Detector Impulse Response



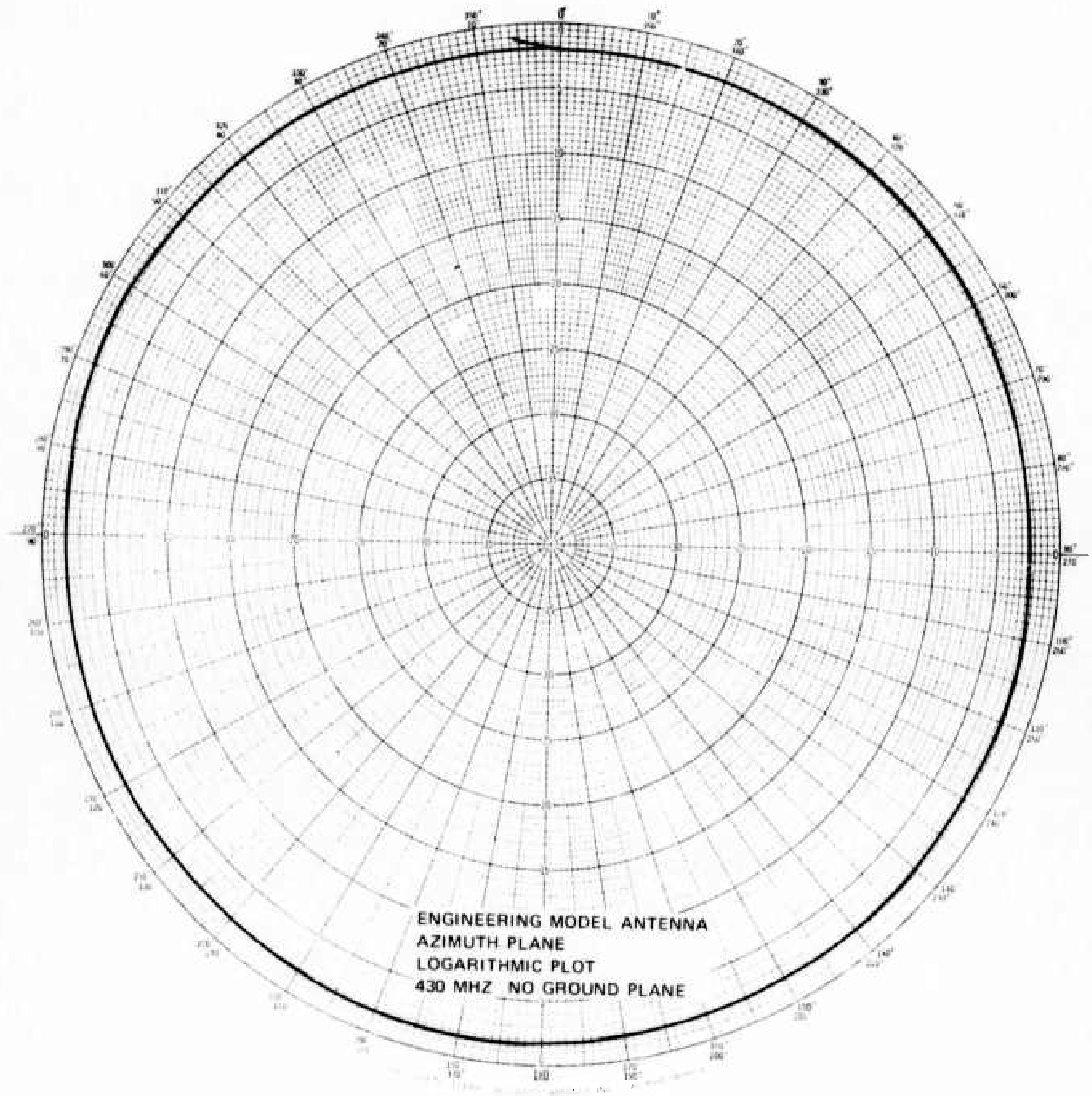
HP 1900A PULSE INPUT

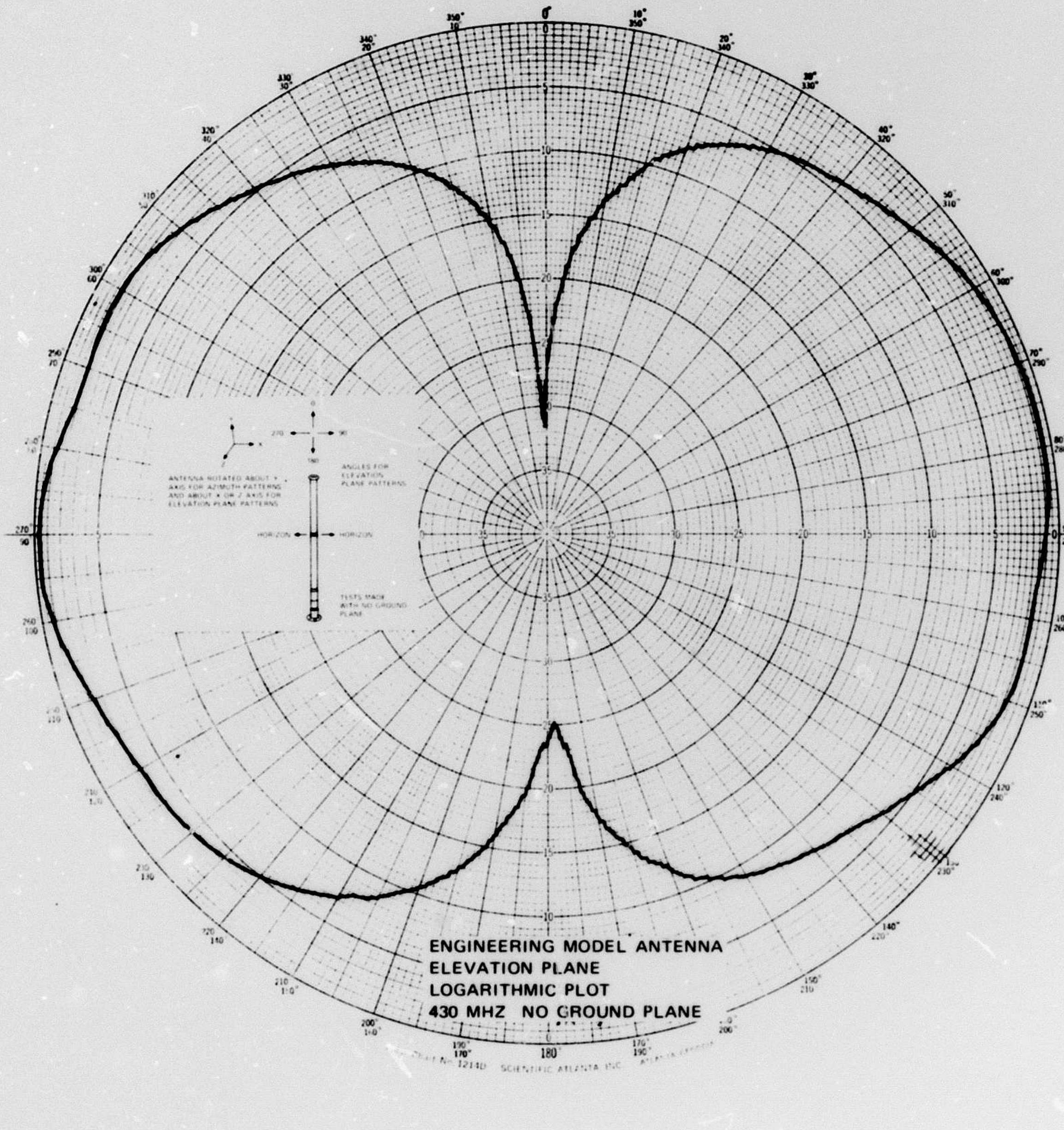


TIME BASE	20 NS/DIV
TOP TRACE	2V/DIV
BOTTOM TRACE	2V/DIV

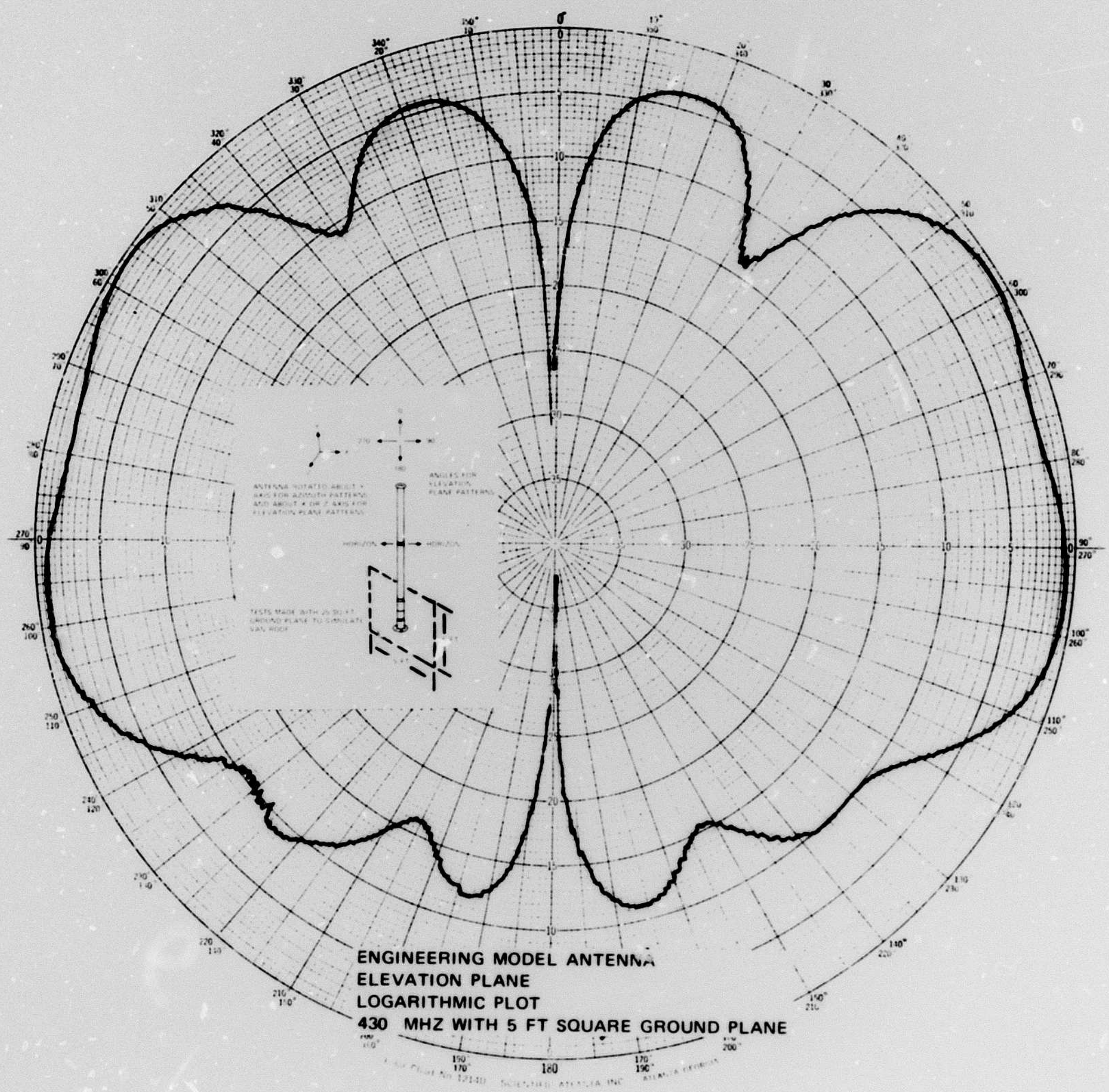
TYP OF AN UNSATURATED DETECTOR

THE DELAY BETWEEN INPUT & OUTPUT NOT VALID DUE TO TEST SETUP

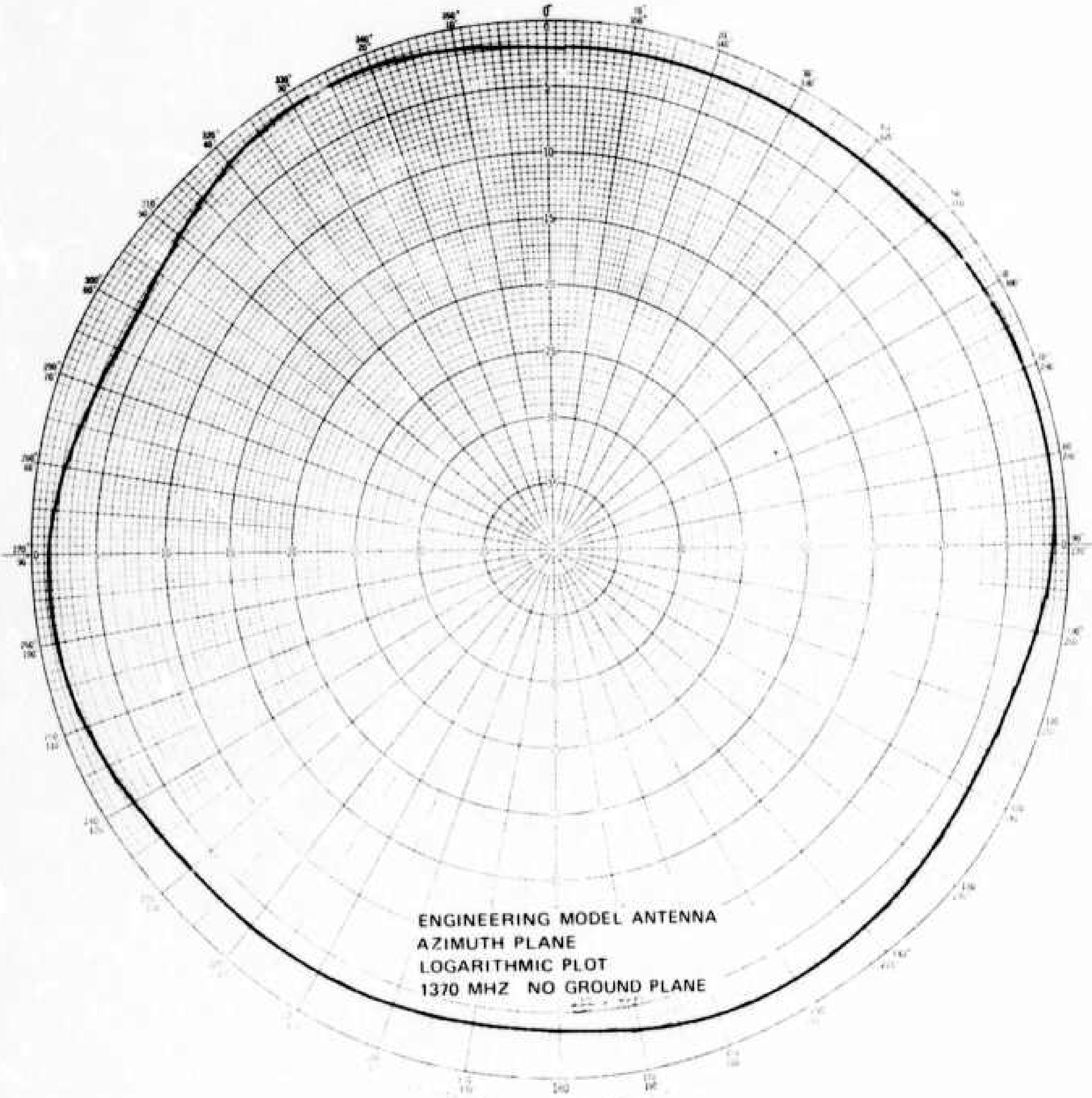

ENGINEERING MODEL ANTENNA
AZIMUTH PLANE
LOGARITHMIC PLOT
430 MHZ NO GROUND PLANE



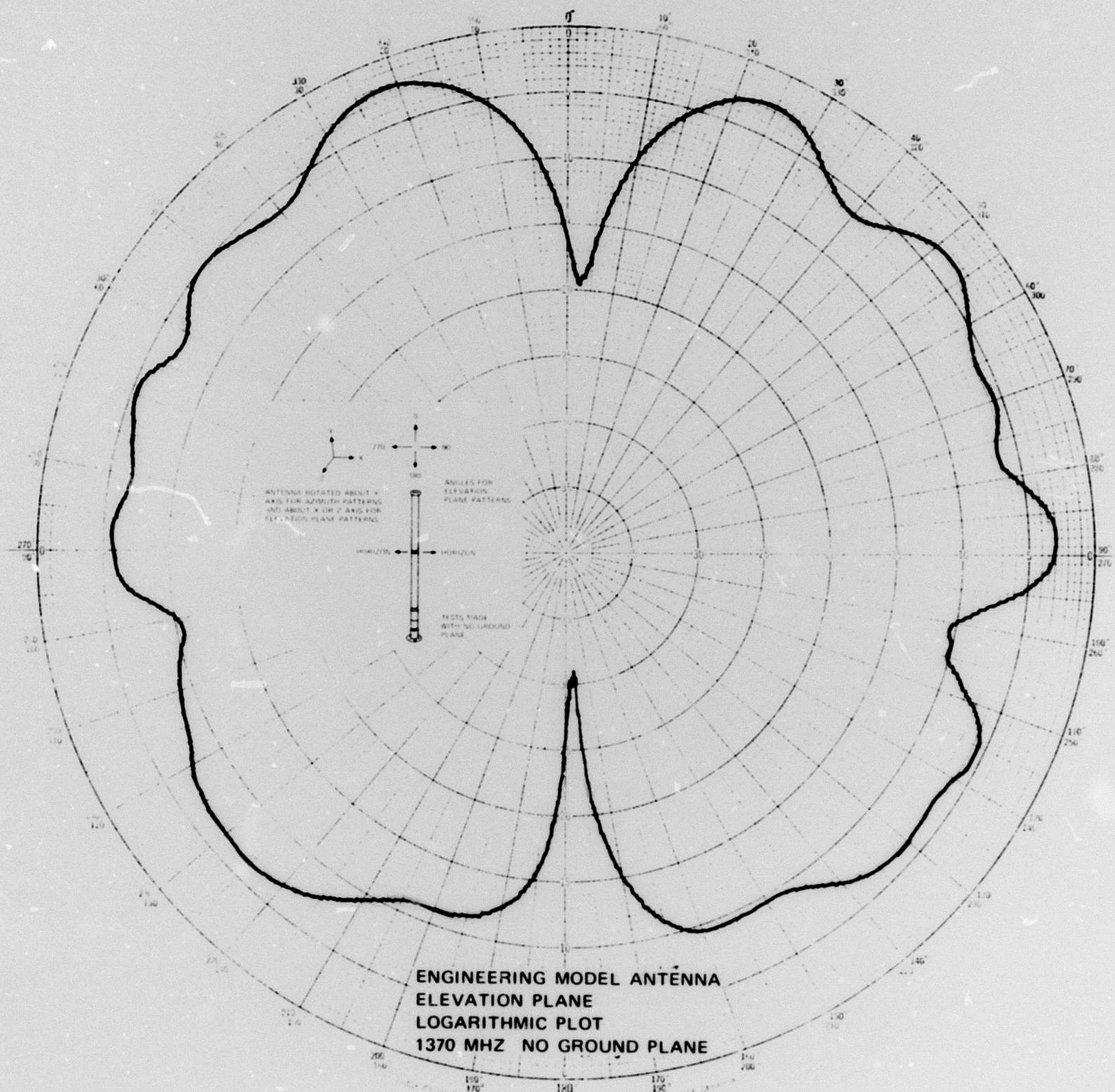
ENGINEERING MODEL ANTENNA
ELEVATION PLANE
LOGARITHMIC PLOT
430 MHZ NO GROUND PLANE

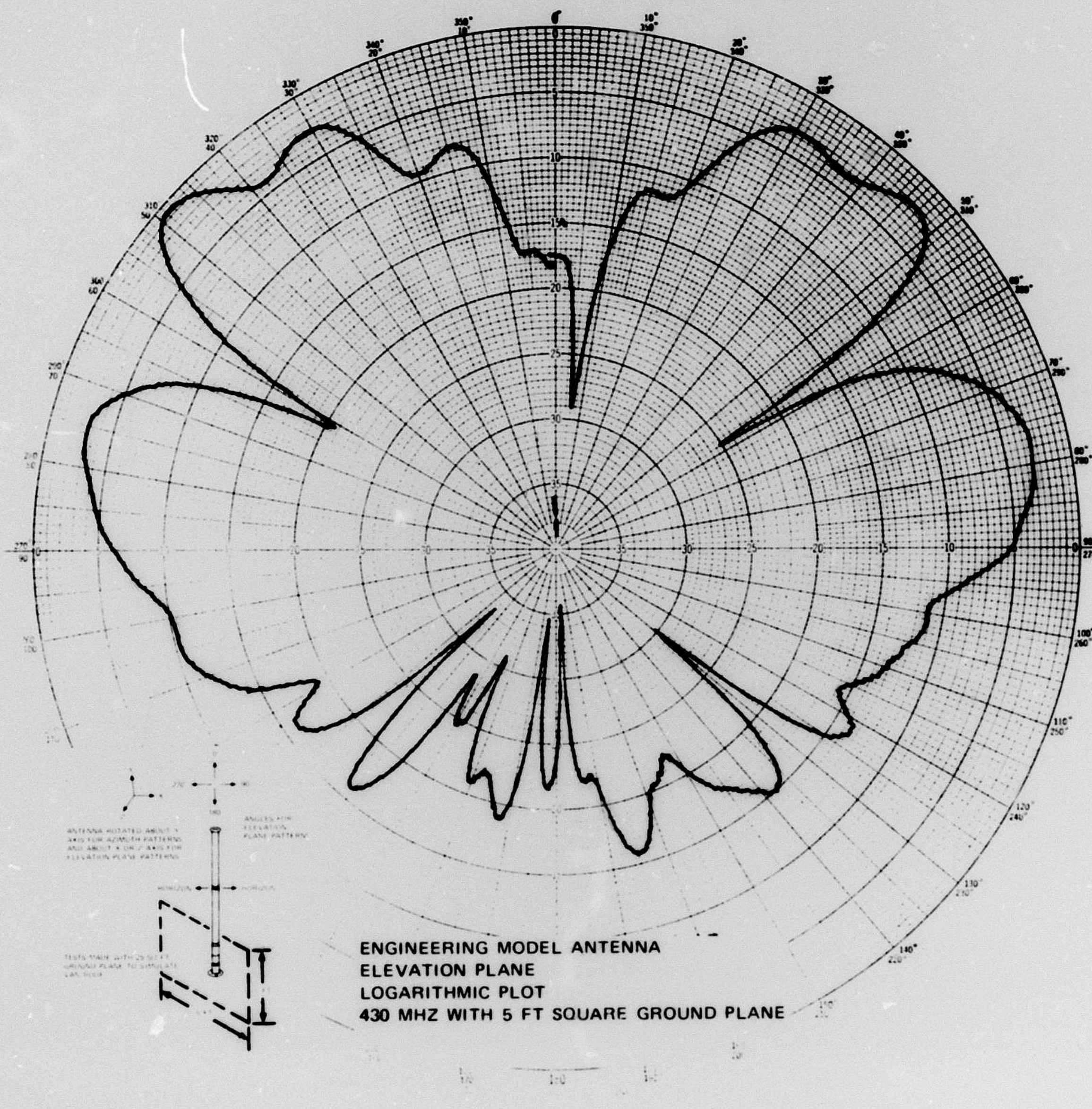


ENGINEERING MODEL ANTENNA
ELEVATION PLANE
LOGARITHMIC PLOT
430 MHZ WITH 5 FT SQUARE GROUND PLANE

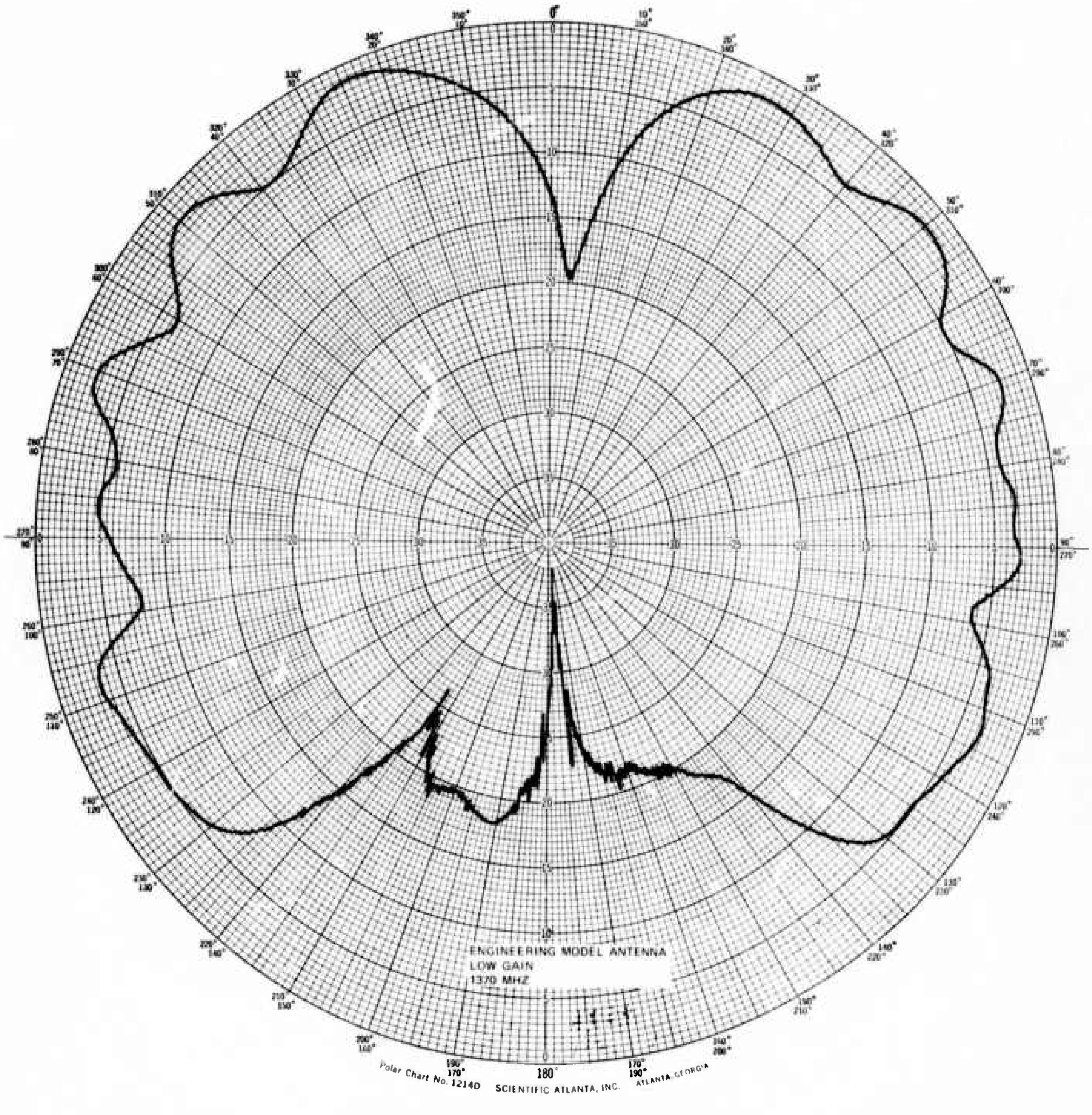


0°
ENGINEERING MODEL ANTENNA
AZIMUTH PLANE
LOGARITHMIC PLOT
1370 MHZ NO GROUND PLANE

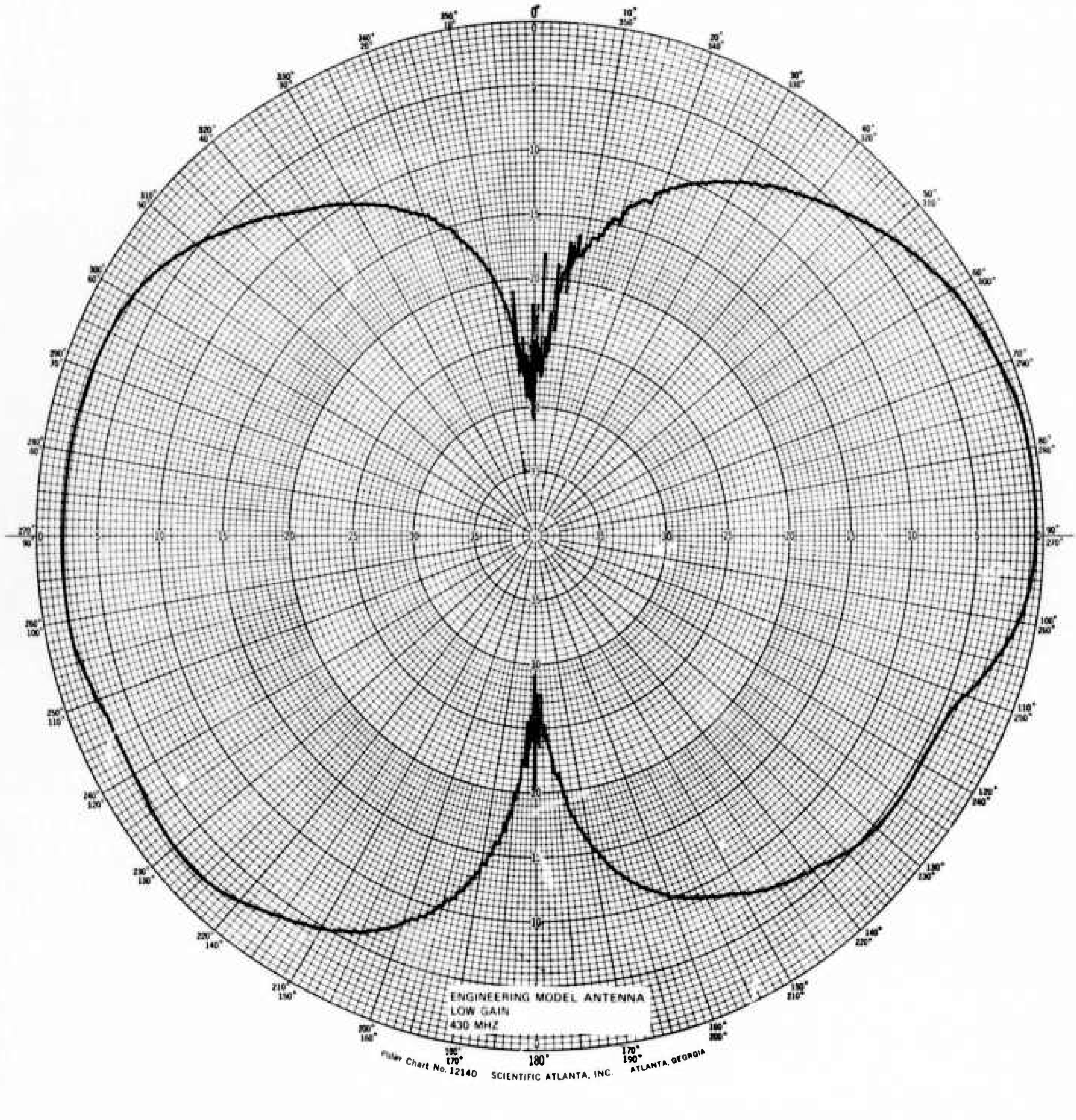

ENGINEERING MODEL ANTENNA
ELEVATION PLANE
LOGARITHMIC PLOT
1370 MHZ NO GROUND PLANE

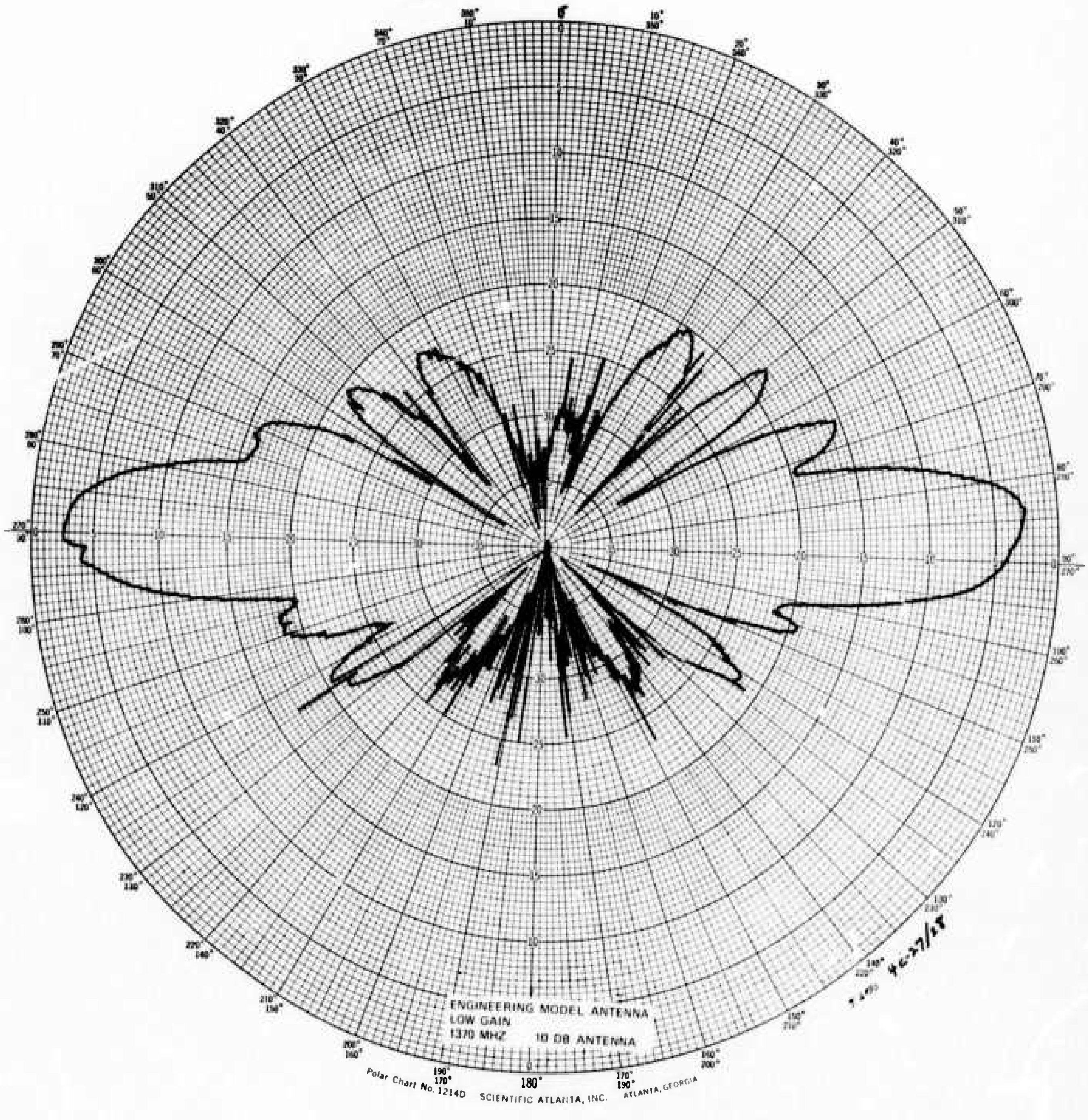


ENGINEERING MODEL ANTENNA
ELEVATION PLANE
LOGARITHMIC PLOT
430 MHZ WITH 5 FT SQUARE GROUND PLANE



ENGINEERING MODEL ANTENNA
LOW GAIN
1370 MHZ
Polar Chart No. 1214D
SCIENTIFIC ATLANTA, INC.
ATLANTA, GEORGIA


0°
90°
270°
180°
ENGINEERING MODEL ANTENNA
LOW GAIN
430 MHZ
Polar Chart No. 1214D SCIENTIFIC ATLANTA, INC. ATLANTA, GEORGIA


0°
180°
ENGINEERING MODEL ANTENNA
LOW GAIN
1370 MHZ
10 DB ANTENNA
Polar Chart No. 1214D
SCIENTIFIC ATLANTA, INC.
ATLANTA, GEORGIA
4C-27/28

END